

D. N. JEFFS

**ONTARIO
WATER
RESOURCES
COMMISSION**

**ANNUAL REPORT
1964**



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ONTARIO WATER RESOURCES COMMISSION
OFFICE OF THE CHAIRMAN

March 31st, 1965.

To the Honourable J. R. Simonett,
Minister of Energy and Resources Management.

Sir,-- I have the honor to submit for your approval
the Ninth Annual Report of the Ontario Water Resources
Commission, made in conformity with and under provisions
of The Ontario Water Resources Commission Act.

I have the honor to be, Sir,

Your obedient servant,

James A. Vance
Chairman.



ONTARIO WATER RESOURCES COMMISSION
OFFICE OF THE GENERAL MANAGER

March 31st, 1965.

Dr. James A. Vance,
Chairman,
Ontario Water Resources Commission,
801 Bay Street,
Toronto 5, Ontario.

Dear Sir:

It is with pleasure that I present to you and the other Commissioners of the Ontario Water Resources Commission this, the Ninth Annual Report of the Commission.

Yours sincerely,

A handwritten signature in cursive script, appearing to read "R. D. Coverly", is written over the typed name "General Manager.".

General Manager.

**NINTH
ANNUAL REPORT**

1964



**Ontario Water Resources Commission
801 Bay Street
Toronto**



ONTARIO WATER RESOURCES COMMISSION

Dr. J.A.VANCE
CHAIRMAN

J.H.H.ROOT, M.P.P.
VICE-CHAIRMAN

H.BROWN
COMMISSIONER

W.D.CONKLIN, Q.C.
COMMISSIONER

L.R.DESMARAIS
COMMISSIONER

D.A.MOODIE
COMMISSIONER



D.S. CAVERLY
GENERAL MANAGER

G.M.GALIMBERT
Asst. GENERAL MANAGER

L.E.OWERS
Asst. GENERAL MANAGER

W.S. MacDONNELL
COMMISSION SECRETARY

TABLE OF CONTENTS

	Page
Introduction.....	(i)
Staff Organization.....	(iv)
Administrative Branches.....	1
Division of Construction.....	12
Division of Finance.....	34
Balance Sheet.....	38
Division of Laboratories.....	40
Division of Plant Operations.....	71
Division of Research.....	78
Division of Sanitary Engineering.....	87
Certificates issued for Water Works...	104
Certificates issued for Sewage Works..	114
Division of Water Resources.....	125
OWRC-Municipal Projects.....	151

Introduction

by

D.S.Caverly

General Manager

The year 1964 was another active one for the Ontario Water Resources Commission. Its program was temporarily interrupted, however, by the death in June of the Commission Chairman, Mr. A.M. Snider, of Waterloo, after a brief illness. Mr. Snider had been Chairman since the Commission's inception in 1956.

Dr. James A. Vance of Woodstock, a Commissioner, subsequently took over as Acting Chairman, a post he held until September 23rd when his appointment as Chairman was announced by the Prime Minister of Ontario, Hon. John P. Robarts, Q.C. At the same time, Mr. Robarts announced the appointment of Commissioner John H. H. Root, M.P.P., of Orton, as Vice-Chairman, and Messrs. L.R. Desmarais of Sudbury and D. Aubrey Moodie of Richmond as new Commissioners.

Highlights of the year's activities included the entry of the Commission into the field of water pipeline construction with a view to supplying consumer municipalities with water at cost, and a renewed and intensified interest in industrial wastes problems, with special emphasis on the pulp and paper industry.

During May, Prime Minister Robarts announced that the OWRC would offer to take over from the City of London's Public Utilities Commission, the project of building a water supply pipeline from Grand Bend on Lake Huron to Arva in the London area. With the agreement of the City of London and the P.U.C. to this proposal, the OWRC entered into a new phase of activity.

The capital cost of the scheme would be financed entirely by provincial funds, with the Commission handling construction, operation, and the eventual sale of water at cost to consumer municipalities. In August, the City of London, its P.U.C. and the Commission signed agreements whereby London became the first customer of the Lake Huron Water Supply System. An official sod-turning ceremony was held at the intake site at Grand Bend in early September. The Lake Huron Water Supply System is unique and marks the first time that a municipal water supply has been handled on such a basis.

In addition, hearings were held in some other sections of the Province, reported to have water supply difficulties, to ascertain needs and supply possibilities. Reports on these hearings were not all available by the year-end, but in some cases there appeared to be considerable interest in obtaining additional water supplies. Studies were commenced in the Essex County area to consider overall water needs and in the Peel County area for overall water and sewage needs. A further study was under way in connection with the provision of secondary lines to the Lake Huron system.

During the year, the Commission took a more intensive look at the problems created by industrial wastes, concentrating first of all, on the pulp and paper industry. Through fact-finding tours, by the Commissioners themselves, of a cross-section of the pulp and paper mill districts in all parts of the Province, and from water resources survey reports and water pollution survey reports compiled by OWRC staff, a much clearer picture of these problems was obtained. Increased Commission action in this matter was anticipated early in 1965.

In the report of the Division of Sanitary Engineering, it was revealed the Commission issued Certificates of Approval for construction of water and sewage works with an estimated value of \$134,346,078--the second highest total in the province's history. The 1964 figures were topped only in 1962 when the total was more than \$147 million. It should be stated that such construction cannot be carried on in the Province without the authority of an OWRC approval certificate.

In 1955, the year before the formation of the Ontario Water Resources Commission, it was estimated that in the ensuing 20 years it would take \$2.4 billion to keep up with current needs in the matter of sewage and industrial waste projects and water supply and purification works. This would average out at \$120 million a year. We were nearing the halfway mark in that 20-year period, as 1964 ended, and it is interesting to note that since the OWRC started work actively in 1957, the value placed on these Certificates of Approval averaged over \$117 million annually.

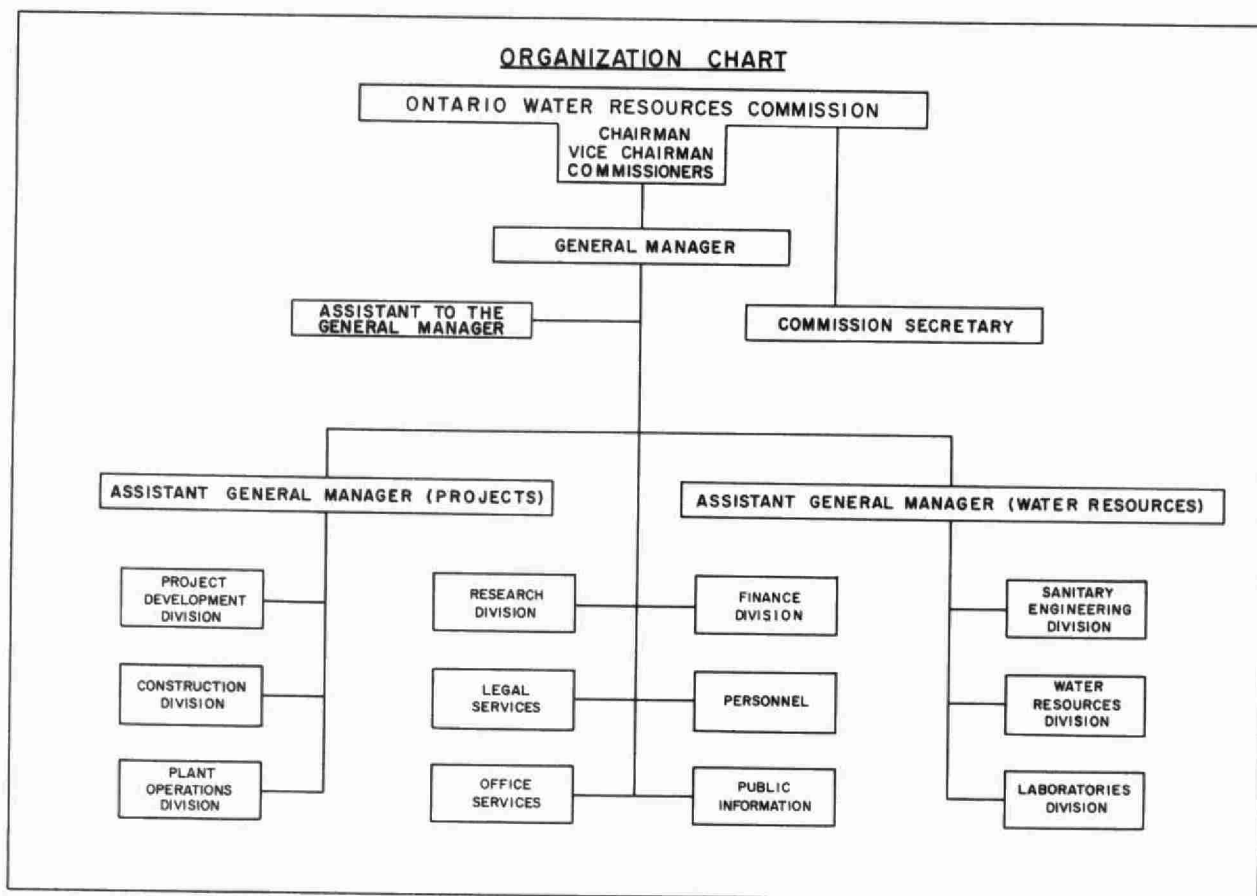
Much of the achievement in this field can be attributed to OWRC suggestion and example. Up to the end of 1964, the Commission was directly involved in assisting 198 Ontario municipalities in such projects with an estimated value of \$118,280,271. OWRC involvement in these projects included engineering and construction, financial arrangements and eventual operation of the joint Commission-municipal works.

There were 178 sewage projects and 136 water projects in these 198 municipalities and all of these were either in operation, under construction or under joint OWRC-municipal agreement to proceed with construction.

It truthfully can be said that installation of all these works throughout the Province cut greatly into the huge back-log which existed eight years ago, and that, furthermore, we are steadily gaining on problems created since then.

Details of all aspects of Commission endeavour will be found in the reports of the various divisions and branches. Most of the technical divisions reported increased activity during the year in various areas of their work and the administrative division kept pace with this enlarged activity.

A handwritten signature in cursive script, appearing to read "A. D. Caverly". The signature is written in dark ink and is positioned in the lower right quadrant of the page.



Staff organization at the year-end:

ADMINISTRATION

General Manager - D. S. Caverly

Assistant General Manager (Water Resources) - G.M. Galimbert

Assistant General Manager (Projects) - L.E. Owers

Assistant to the General Manager - L.M. Tobias

Commission Secretary and Office Services - W.S. MacDonnell

Legal Services

Senior Solicitor - H. Landis

Solicitor - A. Hermant

Personnel

Personnel Director - A.R.W. Uren

Personnel Officer - H.W. Tonkin

Public Information

Information Officer - John C. Scott
Assistant Information Officer - J. M. Black

DIVISION OF FINANCE

Comptroller - D. A. Joynt
Assistant Comptroller - E. F. Heath

DIVISION OF RESEARCH

Director - A. J. Harris

PROJECTS SECTION

Division of Construction

Director - A.W. Shattuck
Assistant Director - J.C.F. Macdonald
Supervisors - W.A.S. Marshall
 - C.J.K. Wilson

Division of Plant Operations

Director - B.C. Palmer
Assistant Director - C.W. Perry
Regional Assistant Supervisors - A.C. Beattie
 - D.A. McTavish

Division of Project Development

Supervisor of Projects - P.G. Cockburn
Chief Property Agent - H.H. Mitchell

WATER RESOURCES SECTION

Division of Laboratories

Director - F.A. Voegelé
Assistant Director - R. H. Millest
Supervisor, Bacteriology - L.T. Vlassoff
Supervisor, Biology - J. H. Neil
Supervisor, Chemistry - C.E. Simpson
Supervisor, Industrial Wastes - R.H. Millest
Supervisor, Purification Processes - J. G. Duncan

Division of Sanitary Engineering

Director - K.H. Sharpe

Assistant Director - J.R. Barr

Supervisor, Field Activities - G.H. Kay

Supervisor, Stream Sanitation - W.A. Steggles

Supervisor, Water Works - G.R. Trewin

Supervisor, Sewage Works - J.R. Barr

Division of Water Resources

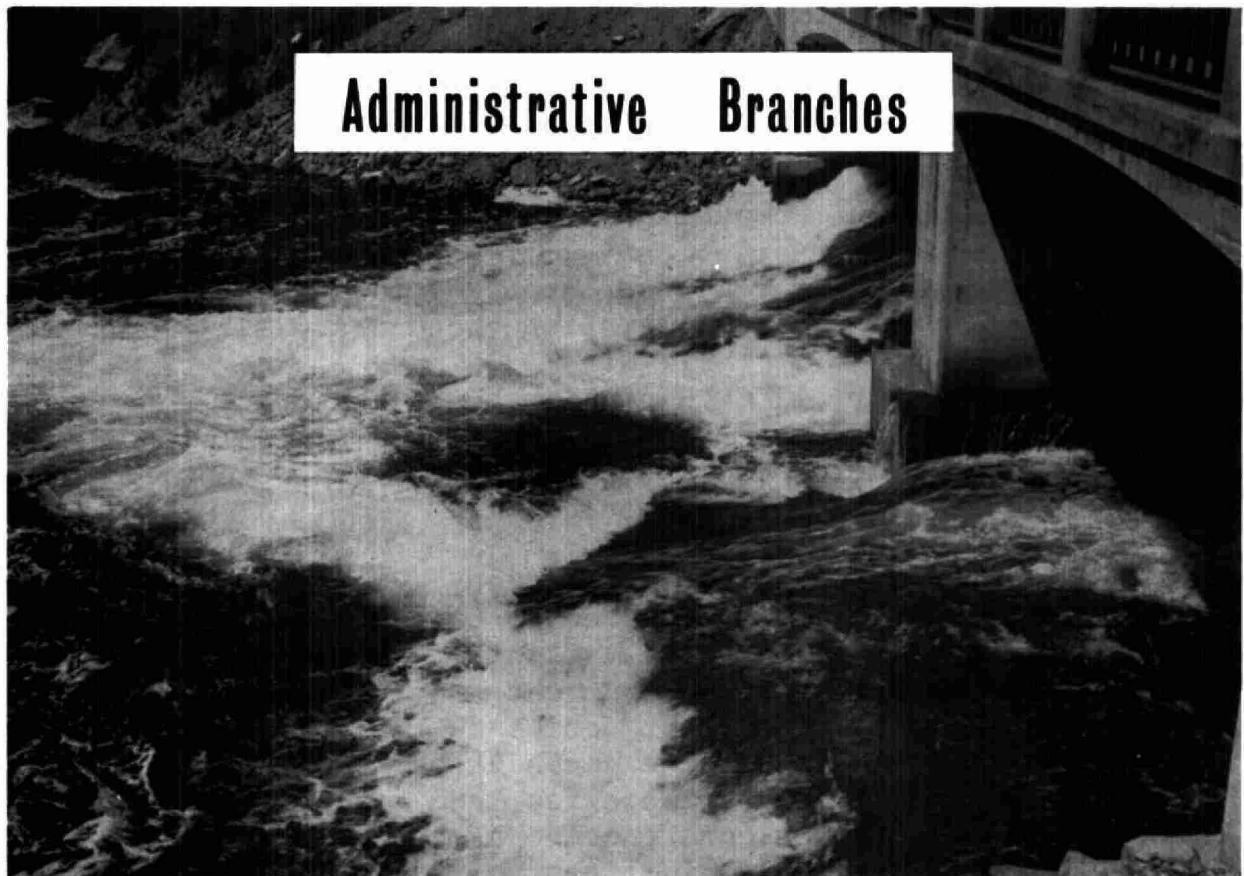
Director - A.K. Watt

Assistant Director - K.E. Symons

Supervisor, Ground Water - D.N. Jeffs

Supervisor, Surface Water - K.E. Symons





Administrative Branches

Information Branch -- John C. Scott, Information Officer.

The main activity of the Information Branch continued to be, as the name implies, dissemination to the general public and others, of information concerning the Commission and its activities. This was accomplished through distribution of a news release service to various media, such as newspapers, TV and radio, trade publications and interested individuals. Involved in this dissemination of information activity also was staff handling of numerous individual enquiries received from a great variety of sources; by mail, telephone and personal visits to the office. Further, members of the Ontario Legislature were kept informed of various OWRC-municipal project activities in their own constituencies.

Other activities included:

The organization of official openings for OWRC-municipal projects and any attendant student education programs scheduled along with some of these ceremonies;

The preparation and placing of all OWRC display advertisements and the placing of tender call advertisements;

The handling of OWRC exhibits, with emphasis on the Commission's annual display at the Canadian National Exhibition;

The preparation and publication of the 1963 annual report;

The preparation of copy and layouts for various published items such as booklets, pamphlets and brochures;

The handling of all OWRC publications, including those for which there was a charge; the writing of special articles and speeches; the operation of a photographic service and a filing system for both photos and slides;

Publication of the staff-orientated OWRC News; and attendance at 40 tender openings by a member of staff.

The news release service, put out under the heading of "Information Service", was most active during 1964. Major items included an announcement of the death of the Commission's first Chairman, Mr. A.M. Snider of Waterloo, and reports of events leading up to a start on construction of the Lake Huron Water Supply System, involving a pipeline from Grand Bend to the vicinity of the City of London. The appointment of Dr. James A. Vance of Woodstock, as chairman, succeeding Mr. Snider, and Mr. John H. Root, M.P.P., of Orton, as vice-chairman, also was announced along with the appointment of two new commissioners.

Other feature releases concerned radioactive conditions in the Elliot Lake and Bancroft areas, 27 reports on water resources and water pollution in various areas or municipalities throughout Ontario, a condensation of the 1963 annual report, the algae research program, and 40 contracts, worth more than \$10 million, awarded for the construction of joint OWRC-municipal water or sewage projects.

Much time and effort went into planning, preparing and operating the OWRC exhibit at the 1964 Canadian National Exhibition. In this, the Information Branch had the welcome assistance of the Mechanical Services Branch which carried out all necessary construction work and painting. It was a diversified exhibit highlighted by displays concerning industrial water use, industrial waste disposal considerations and research activities of the Commission. Popular holdovers from 1963 were the animated hydrologic cycle display and the depiction in fish tanks of the contrast between life in clean water and life in polluted water. For the

first time, OWRC attendants at the CNE were attired in special blue blazers with Commission crests and matching ties, double blue in color.

Exhibit material was loaned from time to time to other organizations interested in one or another of the many aspects in the field of water management and conservation. The most popular portable display was the animated depiction of the hydrologic cycle.

Preliminary investigations were carried out relative to the possibility of the OWRC exhibiting at Ottawa's Central Canada Exhibition and London's Western Fair in 1965.

There were eight official openings held at OWRC projects during the summer and fall--at Exeter, Fort Frances, Burlington, Fort William, Belle River, Elora, Galt and Newmarket-East Gwillimbury. Branch personnel, in co-operation with local authorities, organized these ceremonies and prepared special brochures for each opening. In some cases special advertisements were placed in local newspapers, and special displays were arranged in some instances. To inaugurate work on the Lake Huron Water Supply System, a sod-turning ceremony was held in September, with Hon. John Robarts, Q.C., Prime Minister of Ontario, officiating.

As the year ended material for a revised OWRC booklet--"The Ontario Water Resources Commission"--was completed and was being readied for an early 1965 printing job. Another publication--"The Story of Water"--also was nearing completion at the year-end. A 1964 publication which proved most popular was "The Hydrologic Cycle".

Special photographic assignments concerned the obtaining of suitable color transparencies for the CNE exhibit, and the recording of various phases of several items on the schedule of the Division of Research. The branch's photo and slide files were in constant demand as they continued to expand in quantity and variety.

Special material was supplied to feature writers for articles in Weekend Magazine, the Thomson Newspapers, and the Financial Post. Numerous queries from individual representatives of newspapers and TV and radio stations were handled promptly.

Thirty-two tender call advertisements were placed during the year.

Legal Branch -- H. S. Landis, Senior Solicitor.

During the year the Legal Branch provided a general advisory service to the Commission and to its personnel, supervised legal actions conducted on behalf of the Commission, and prepared agreements and other legal documents.

There were several amendments to The Ontario Water Resources Commission Act in 1964:

1. The Commission was empowered to obtain, ex parte, an injunction to prevent the pollution of water in emergencies.
2. With certain limited exceptions, the Commission was empowered to prohibit the taking of water without a permit from the Commission where the taking interfered, in the opinion of the Commission, with any public or private interest in water.
3. Provision was made for the Commission to prohibit and to regulate:
 - (a) the flowing or leaking of water from a well or the diversion or release of water by means of an excavation made in the ground for any purpose other than the taking of water; and
 - (b) the drilling and boring of wells for the purpose of obtaining water in certain areas of the Province designated by regulations of the Commission.
4. Offences were created for the contravention of several sections of the Act and of certain approvals, directions and orders of the Commission under the Act.
5. Where the Commission had authority under the Act to require that any thing be done by a municipality or a person, the Commission was empowered to require that in default of its being done, such thing shall be done at the expense of the municipality or person, and to recover such expense from the municipality or person.
6. Provision was made for the Commission to restrain by legal action any contravention of any provision of the Act or any regulation, direction, order, approval, notice or permit made, given, served or issued by the Commission under the Act.
7. The power of the Commission to make regulations was extended to cover, for the purpose of preventing or reducing the pollution of water, the regulation of the storage and treatment of

sewage in boats, the prohibition and regulation of the discharge of sewage from boats, the regulation and control of places where moorings or services are provided for boats and of persons providing such moorings or services.

8. The period within which proceedings may be taken to enforce any provision of the Act or of any regulation made under the Act was extended from six months to one year.

The complicated claim against a bond company arising out of the Town of Listowel Sewage Works Project was settled satisfactorily.



Personnel Branch -- A. R. W. Uren, Director.

New and enlarged programs undertaken by the Commission for 1964 continued the staff growth trend experienced in previous years. This necessitated formulation of plans by the Personnel Branch to achieve the objective of a staff of 392, an increase of 41 from the previous authorization.

As soon as budgetary details had been approved, the new recruiting program was launched. An aggressive campaign of on-



campus interviews at Ontario education institutions commenced in mid-January. The objective was to attract graduates from engineering, science and technological courses.

Despite attractive offers by other employers and a Canada-wide wave of economic progress which tended to reduce the available supply of skilled personnel, the OWRC objective of recruitment of new professionals was substantially achieved. Recruitment of staff for a few positions calling for highly specialized training involved screening and negotiations with candidates from overseas and the United States.

During the year, the long-standing practice of sponsoring graduate studies for professional personnel was augmented by a further progressive step. A program of financial assistance was instituted for employees undertaking approved courses to improve their qualifications for the performance of their duties. Considerable interest resulted in staff undertaking courses in mathematics, statistics, psychology, chemical technology and instrumental methods, to mention a few.

Although the growth of the work force at Commission plants did not match the previous year, the expansion did amount to approximately 10 per cent, with a total of 210 at the year-end.

Head Office staff complement similarly registered approximately a 10 per cent gain to 376. Despite the several unfilled engineering vacancies, the total of all unfilled positions at the end of December amounted to approximately four per cent.

The summer program for the year again was carried out with the assistance of students--39 in 1964. These were recruited from the undergraduate years at universities and technical institutes. Employment was offered in office and field activities under engineers or other professional and technical personnel, and in the laboratories as student technicians. The employment of students achieved three objectives, as in past years, several months of training in work related to their chosen vocations, in acquainting students with career opportunities in the Commission, and accomplishing a considerable amount of extra work.

The policy of student employment and training resulted in a favorable Commission image among student groups and substantially assisted in attracting graduates to the Commission.



Real Estate Branch -- H. H. Mitchell, Chief Property Agent.

The 1964 period commenced as a rather slow period in the Real Estate Branch, but activity gathered momentum as the year progressed. The most noticeable factor was the trend toward projects for smaller municipalities. This had the effect, in general, of reducing the amounts paid for individual sites and easements.

The major difficulty encountered by the branch during the year continued to be the finalizing and closing out of projects. Solicitors employed by the Commission had to be reminded continually to register documents, return registered copies to the Commission, and, in many cases, even to submit their accounts. In four cases, representations were made to the Upper Canada Law Society for assistance in closing these transactions and, in one case, work was taken away from one solicitor and given to another to handle. A substantial improvement was noticed by the end of the year.

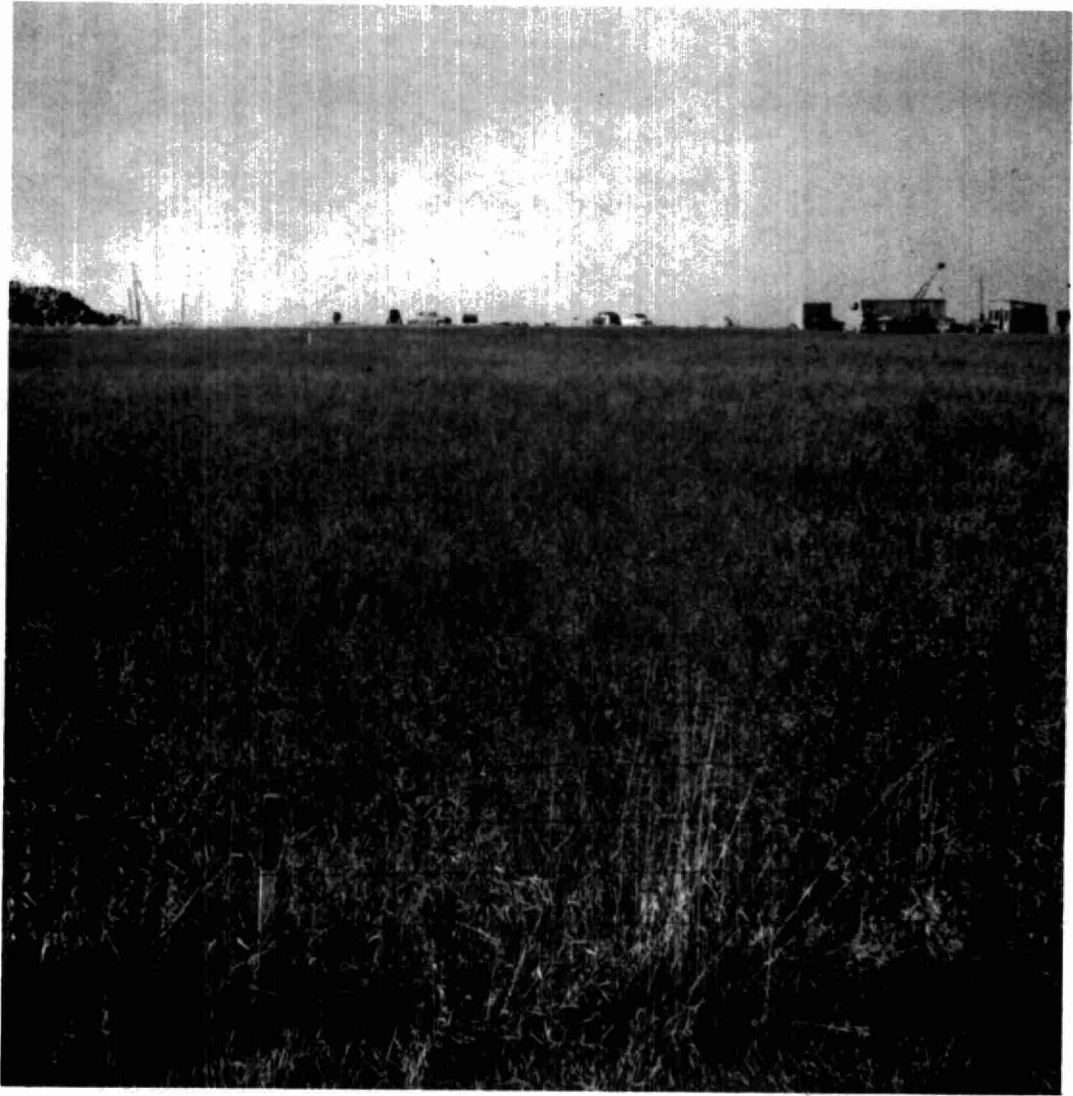
Expropriations

The Commission's policy on expropriations remained unchanged--the last resort, to be used only when all other methods of acquisition had failed. Some changes were made in procedures due to the new Provincial Expropriation Procedures Act. Branch activity in this regard, however, was adjusted without much difficulty, and the following expropriations were approved by the Commission during the year:

Approved for Expropriation	- 59
Expropriations Actually Registered	- 40

It can be seen that close to 68 per cent of the expropriations approved by the Commission were actually registered, a slightly higher proportion than the previous year. Of the 20 expropriations settled, five were for properties expropriated during 1964 and 15 for properties expropriated earlier. During the year the Commission maintained its practice of seeking to settle expropriations on the original valuation and was successful in all the above cases. The status of expropriations:

Expropriations awaiting settlement	- 105
December 31, 1963	
Expropriations registered during	- 40
1964	
Expropriations settled during	- 20
1964	
Expropriations awaiting settlement	- 125
December, 1964	



The most significant decision concerning arbitrations was concerned with the Paris project. In 1963, a protracted arbitration case was held before the OMB. In this case, the great majority of the damages hinged on the Board's decision as to whether the mere construction of a sewage treatment plant automatically depreciated surrounding land values. The final award of the Board was substantially in favor of the Commission. The amount offered by the Commission was \$5,000, the amount claimed by the owner was \$50,000 and the Board's award was \$5,175.

An application was made to the Supreme Court of Ontario to appeal this decision by the owner. After hearing the submission



the application was rejected by the court, leaving judgment in favor of the Commission.

Taxes

The branch's proposals to check assessments and conduct tax appeals, scheduled to begin in the summer of 1964, had to be indefinitely postponed upon the assumption of work in connection with the Lake Huron Water Supply System. One tax appeal was conducted during 1964, however, in the Town of Lindsay where, after an initial rejection of the OWRC appeal by the Court of Revision, an appeal to the county judge was successful.

One further appeal involving the Town of New Liskeard was pending at the year-end.

Lake Huron Water Supply System - W.P. 64-1

The main project of the branch during the year was acquisition of land and easements in connection with the Lake Huron Water Supply System. Approximately 128 easements were required, together with three freehold parcels. Title searches were carried out and surveys were prepared by mid-October. Working with an estimated three-months time limit, additional staff was required to carry out the numerous calls. Two property agents were obtained, on loan, from the Department of Highways, and a replacement obtained for one member of the staff who resigned just prior to commencement of the work. At the year-end, negotiations were on schedule and after some initial difficulties the acquisition appeared to be proceeding smoothly.

A major change in policy was occasioned by this pipeline project in that expropriation was used over the whole route as a conveyancing device for the first time. It was felt essential that this be done in order to eliminate possible costly legal problems, to obtain the benefit of The Expropriation Procedures Act

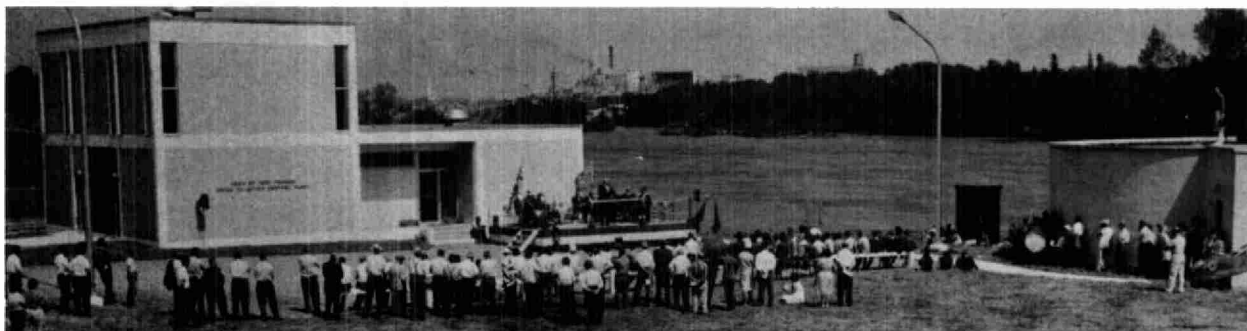
regarding onus of payment for properties under \$1,000 in value, and prevent any possible holdup on the line. Another major departure was the taking over by the Commission of the conveyancing procedure following expropriation.

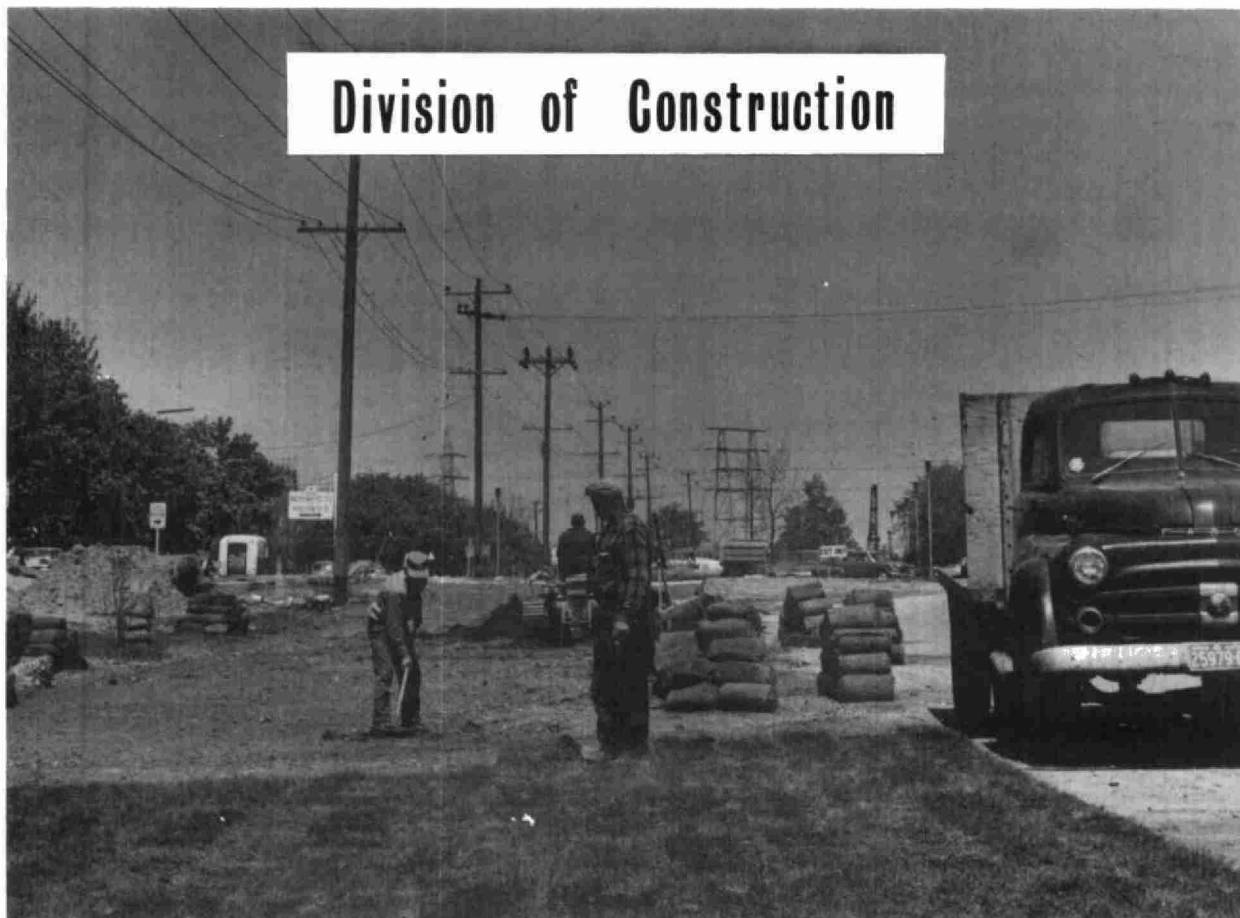
After completing negotiations with the owner, the Commission registered plans, searched title, served all notices, handled individual payments and completed all other conveyancing requirements.

This resulted in a temporary increase in clerical staff, but undoubtedly also resulted in substantial savings in fees. Of major importance, however, when considering this step, was the fact that we felt the matter could be handled faster and more efficiently by our own staff preserving good relations on this project. This opinion was fully justified by results achieved by the end of the year.

The other important decision taken in this connection was the method of payment for the line. Initially, it had been proposed to make a flat payment and make no arrangements to replace topsoil. Subsequently, the owner was given the opportunity to decide whether he wished to have topsoil replaced and seeding done, or to accept a cash settlement. This proved to be an extremely popular move as it gave the owners a feeling they had some control over the work done on their property. At the year-end it appeared that only 20 per cent of the owners wished topsoil to be replaced, and only 13 per cent wished the Commission to do seeding and sodding. Before this option clause was initiated, approximately 80 per cent were insisting on topsoil replacement.

It was decided to divide the compensation into two portions and pay owners for the land and easements prior to construction. Prompt payment removed one of the biggest sources of discontent in owners dealing with government agencies, and made settlement of outstanding properties much easier. Once construction was completed, each owner would have to be contacted again to settle for damages done across his property.





A. W. Shattuck, Director
J. C. F. Macdonald, Assistant Director

During 1964, the Commission entered into 40 contracts valued at \$10,094,756.73 of which \$6,069,715.97 was for sewage works and \$4,025,040.76 for water works.

During the year, 49 contracts were completed. These had a total value of \$14,367,128.94, and consisted of 33 sewage works totalling \$12,627,920.56 and 16 water works at \$1,739,208.38.

The costs given above and under the project headings below are exclusive of Central Mortgage & Housing Corporation and winter works subsidies.

Townships of Anson, Hindon & Minden (61-W-81)

Description of Project: Contract 1 - Watermains and pumping station.

Final contract cost -
\$116,559.42.

Contract 2 - Extensions to water-
mains.
Final contract cost -
\$12,003.05.

Consulting Engineers: R. V. Anderson Associates Ltd.,
Toronto.

Completed: Contract 1 - January 29.

Contract 2 - June 18.

Estimated Project Cost: \$155,000.00.

Belle River (63-W-111)

Description of Project: Contract 1 - 36" water intake and
crib.
Final contract cost -
\$77,224.44.

Contract 2 - Addition to water
treatment plant.
Final contract cost -
\$60,591.86.

Consulting Engineers: C. G. Russell Armstrong, Windsor.

Completed: Contract 1 - December 1, 1963.

Contract 2 - May 1.

Estimated Project Cost: \$152,500.00.

Burlington (63-S-159)

Description of Project: East End sanitary trunk sewer.
Estimated Contract Cost - \$416,000.00

Consulting Engineers: James F. MacLaren Limited, Toronto.

Substantially Completed: August 11.

Estimated Project Cost: \$480,000.00

Construction commenced in February on the 72-inch sewer and
was substantially completed in August. A six-week general strike
in the spring delayed the work and forced an extension to the con-

tract. Testing revealed no leaks and the entire project was constructed most satisfactorily.

Burlington (64-S-165)

Description of Project: Northshore Blvd. trunk sanitary sewer.
Estimated Contract Cost - \$108,000.00.

Consulting Engineers: James F. MacLaren Limited, Toronto.

Substantially Completed: November

Estimated Project Cost: \$122,600.00.

Construction commenced on July 6 and was completed in November. The work consisted of approximately 4,000 feet of 18-inch and 15-inch sewers. Testing of the sewers disclosed a leakage of half the allowable.

Chalk River (63-W-113)

Description of Project: Installation of 17,900 lin. ft. of watermain, 33 hydrants and 5,300 lin. ft. of service connections. Extension of an existing pumphouse, the installation of pumps and controls.

Consulting Engineers: M. H. Dineen & Associates Ltd.,
Ottawa.

Expected Completion Date: March, 1965

Estimated Project Cost: \$149,600.00.

Work on this project commenced on September 9 and was approximately 90% complete by the end of the year.

Chatham (62-S-102)

Description of Project: Contract 1 - Water pollution control plant.
Est. contract cost -
\$1,518,749.00.

Contract 2 - North Side interceptor sewers, forcemain and one pumping station.

Final contract cost -
\$197,682.55.

Contract 3 - North Side interceptor
sewers, forcemains and
two pumping stations.
Final contract cost -
\$360,420.81.

Contract 4 - South Side interceptor
sewers, forcemains and
two pumping stations.
Est. contract cost -
\$522,476.00.

Contract 5 - King Street interceptor
sewer.
Est. contract cost -
\$371,777.97.

Contract 6 - Outlet sewer from Merritt
Avenue to W.P.C.P.
Est. contract cost -
\$198,805.68.

Consulting Engineers: Todgham & Case Ltd., Chatham.
Gore & Storrie Ltd., Toronto.

Completed: Contract 2 - June 12.
Contract 3 - June 18.
Contract 4 - September 10.

Expected Completion Date:
Contract 1 - March 1965.
Contract 5 - Work not commenced.
Contract 6 - April 1965.

Estimated Project Cost: \$3,146,343.00

Contract 1 - Work was approaching completion, but a considerable amount of testing and adjustment of equipment remained unfinished at the year-end. This extended the contract beyond the revised completion date of December 1.

Contract 4 - Work was completed in September but negotiations were under way to finalize costs for tunnelling sections of the sewer on Wellington and King Streets.

Contract 5 - Tenders were called on November 25. Ontario Municipal Board approval had not been received by the end of the year.

Contract 6 - Work commenced on this contract early in October. Progress was satisfactory and completion was expected well ahead of the official completion date. Work had to be suspended on Riverview Drive during the sugar beet delivery season.

Plans and specifications were received and reviewed for Contracts 7 and 8, industrial area sewers and the Park Avenue sewer, respectively. Tenders had not been called by the year-end pending OMB approval of portions of the work which were not included in the preliminary agreement with the municipality.

Plans were being prepared for the Merritt Avenue pumping station.

Cornwall (64-S-172)

Description of Project:	Contract 1 - Brookdale Avenue diversion sewer. Est. contract cost - \$609,187.00.
	Contract 2A - Leitch-McLennan storm drainage system. Est. contract cost - \$484,487.00.
	Contract 2B - Leitch-McLennan storm drainage system. Est. contract cost - \$352,694.00.
Consulting Engineers:	Gore & Storrie Ltd., Toronto.
Expected Completion Date:	Contract 1 - January 1966. Contract 2A - July 1965. Contract 2B - July 1965.
Estimated Project Cost:	\$1,932,800.00

Contracts were awarded in December and contractors were ordered to commence work on January 4.

Eganville (61-W-93)

Description of Project: Contract "A" - Construction of 11,300 lin. ft. of watermain 6" to 10" diameter and 146 service connections.
Est.contract cost - \$98,286.00.

Contract "B" - Construction of a water filtration plant including construction of an "intake" into the Bonnechere River, the installation of pressure filters, pumps, chlorination equipment and controls.
Est.contract cost - \$45,000.00.

Consulting Engineers: R. V. Anderson Associates Ltd., Toronto.

Completed: October.

Estimated Project Cost: \$165,900.00.

Elmira (61-S-96)

Description of Project: Joint sewage treatment plant with Naugatuck Chemicals.

Consulting Engineers: Canadian-British Engineering Consultants, Toronto.

Substantially completed: December 2.

Estimated Project Cost: \$610,000.00.

Elmvale (62-S-118)

Description of Project: Contract 1 - Forcemain and sewage lagoon.

Est. contract cost -
\$54,000.00.

Contract 2 - Sewers and pumping
station.
Est. contract cost -
\$96,000.00.

Contract 3 - Part A. Sewer and
forcemain on Amelia
Street and secondary
pumping station.
Part B. Repairs and
completion of Contract 2
on a "cost plus"
basis.
Est. contract cost -
\$104,530.00.

Consulting Engineers: Proctor & Redfern, Toronto.

Completed: Contract 1 - August, 1963.

Expected Completion Date: Contract 2 - June.
Contract 3 - June.

Estimated Project Cost: \$180,000.00.

Elora (62-S-125)

Description of Project: Contract "A" - Sanitary sewers,
pumping station
and forcemain.
Est. contract cost -
\$257,000.00.

Contract "B" - Water pollution
control plant.
Est. contract cost -
\$102,000.00.

Consulting Engineers: R. V. Anderson Associates Ltd.,
Toronto.

Substantially completed: Contract "A" - November 1.
Contract "B" - September 14.

Estimated Project Cost: \$411,000.00.

Township of Ernestown (63-S-115)

Description of Project: Construction of a sewage pumping station complete with pumps, standby equipment and controls. Installation of 5,450 lin. ft. of force main and construction of a 7.5 acre lagoon.

Consulting Engineers: J. D. Lee & Co. Ltd., Kingston.

Completed: November 1.

Estimated Project Cost: \$120,500.00



Essex (63-S-142)

Description of Project: Outlet sewer, pumping station, forcemain and two-cell lagoon.

Consulting Engineers: C. G. Russell Armstrong, Windsor.

Completed: December 23.

Estimated Project Cost: \$185,220.00.

Essex (63-S-143)

Description of Project: Industrial waste disposal system.

Consulting Engineers: C. G. Russell Armstrong, Windsor.

Tenders were called for a spray irrigation system in November 1963. Prices were high, so a revised design using aerated lagoons was prepared. It was expected tenders would be called early in 1965.

Township of Fauquier (61-S-79) (61-W-78)

Description of Project: Sewers, watermains, water supply and sewage lagoon.

Consulting Engineers: Sutcliffe Co., New Liskeard.

Expected Completion Date: May, 1965.

Estimated Project Cost: \$235,000.00.

Sewers and watermains were installed during the fall and early winter. The contract closed down in the middle of December.

Fort Frances (60-S-59) (Contracts A, B, C and D)

Description of Project: Sewers, pumping stations, forcemain and sewage treatment plant.

Consulting Engineers: W. L. Wardrop & Associates

Completed: June 30.

Estimated Project Cost: \$2,050,000.00.

Fort William (61-S-91) (Contracts A, B, C, D, and E)

Description of Project: Sewage treatment plant including
influent and outfall sewers.

Consulting Engineers: W. L. Wardrop & Associates

Completed: March 20.

Estimated Project Cost: \$2,800,000.00

Geraldton (63-W-115)

Description of Project: Watermain extension.

Consulting Engineers: W. L. Wardrop & Associates

Completed: April 15.

Estimated Project Cost: \$140,000.00

Harriston (62-S-123)

Description of Project: Contract "A" - Sanitary sewers,
two pumping stations
and force main.
Est. contract cost -
\$190,000.00.

Contract "B" - Lagoon and related
structures and
sewers.
Est. contract cost -
\$88,000.00.

Consulting Engineers: W. M. Veitch Associates, London.

Substantially Completed: Contract "A" - December 23.
Contract "B" - November 6.

Estimated Project Cost: \$338,000.00.

Kincardine (62-S-110)

Description of Project: Service connections, trunk sewers,
two pumping stations, forcemain and
lagoon.

Consulting Engineers: M. M. Dillon & Co. Ltd., London.

Completed: December

Estimated Project Cost: \$490,500.00.

Lake Huron Water Supply System (OWRC-WP-64-1)

Description of Project: Contract 1 - 72" diameter lake intake and 42" diameter plant drain.
Est. contract cost - \$2,232,000.00.

Contracts 2 to 6 - Construction of low lift pumping station, water treatment plant, high lift pumping station, approximately 30 miles 42" diameter pipe and 12 million gallon terminal reservoir near Arva.
Est. contract costs - \$12,000,000.00.

Consulting Engineers: James F. MacLaren Limited, Toronto.

Expected Completion Date: Contract 1 - November 1965.
Contracts 2 to 6 - November 1966.

Estimated Project Cost: \$15,000,000.00.

Work on the intake and plant drain commenced in September. Good progress was made on the land section which included 170 feet of 72" diameter pipe in the tunnel. The land phase of the work was virtually completed by mid-December. By that time 650 feet of 42" diameter plant drain had been installed in the lake. Work on the marine section was suspended in December.

Documents for the remaining contracts were expected to be received during the first two months of 1965.

Little Current (63-S-157)

Description of Project: Sewers, lift station, forcemain and lagoon for the town.

Consulting Engineers: R. K. Kilborn & Associates,
Toronto.

Completed: October 7.

Estimated Project Cost: \$210,000.00.

Township of Louth (63-W-107)

Jordan Village & Jordan Station - Water Area #8

Description of Project: Contract 1 - Water distribution
mains.
Final contract cost -
\$141,489.82.

Contract 2 - Concrete water reservoir.
Final contract cost -
\$28,936.55.

Consulting Engineers: Proctor & Redfern, Toronto, and
St. Catharines.

Completed: Contract 1 - May 15.
Contract 2 - August 15.

Estimated Project Cost: \$195,700.00.

Township of Markham (62-W-102)

Description of Project: Contract 1 - Steeles Avenue watermains
Final contract cost -
\$101,284.82.
Contract 2 - Rehabilitation of
existing water treat-
ment plant on Steeles
Avenue and the two
deep wells at Leslie
Street (#2) and at the
German Mills Road
(#3).
Final contract cost -
\$59,043.22.

Consulting Engineers: Crysler, Davis & Jorgensen Ltd.,
Willowdale.

Completed: Contract 1 - September 30, 1963.
Contract 2 - July 31.

Estimated Project Cost: \$313,500.00.

McGregor (Townships of Anderdon and Colchester North) 63-W-127)

Description of Project: Feeder main and distribution system.

Consulting Engineer: C. G. Russell Armstrong, Windsor.

Expected Completion Date: January 1965.

Estimated Project Cost: \$230,000.00.

Work started in September and, with the exception of a dozen connections, was completed by the year's end, approximately one month after the required completion date.

Midland (63-S-146) (63-S-151)

Description of Project: Contract 1 - Storm and sanitary collector force main, pumping stations and outfall.
Final contract cost - \$407,376.85.
Contract 2 - Sewage treatment plant and pumping station.
Est. contract cost - \$506,904.00.

Consulting Engineers: Canadian-British Engineering Consultants, Toronto.

Completed: Contract 1 - November 1.

Expected Completion Date: Contract 2 - February 28, 1965.

Estimated Project Cost: \$930,000.00.

Work on Contract No. 2 was 80% complete by the end of the year. This contract was expected to be completed on schedule.

Newcastle (63-W-120)

Description of Project: Extension of existing watermains by 1,510 lin. ft. using 6" and 8" diameter asbestos cement pipe, including hydrants and services.

Consulting Engineers: Crysler, Davis & Jorgensen Ltd., Willowdale.

Completed: May 18.

Estimated Project Cost: \$21,300.00.

New Liskeard (62-S-116)

Description of Project: Pumping stations, forcemain and lagoons.

Consulting Engineers: Sutcliffe Co., New Liskeard.

Substantially Completed: October.

Estimated Project Cost: \$345,000.00.

Newmarket-Township of East Gwillimbury (61-S-87)

Description of Project: Contract 2 - Joint water pollution control plant of 2.0 M.G.D. capacity.
Estimated contract cost-\$915,614.51.

Consulting Engineers: James F. MacLaren Ltd., Toronto

Completed: November 19.

Estimated Project Cost: \$1,041,000.00.

Owen Sound (60-S-68)

Description of Project: Contract 4 - Storm sewers in low sections of the municipality.

Consulting Engineers: Gore & Storrie Ltd., Toronto.

Completed: July.

Estimated Project Cost: \$485,000.00.

Parry Sound (62-S-113)

Description of Project: Contract "A" - Sanitary trunk sewer, force mains and river crossings. Final contract cost - \$377,926.00.

Contract "B" - Lift station (seven) Est. contract cost - \$99,986.00.

Contract "C" - Primary sewage treatment plant. Est. contract cost - \$280,604.00.

Consulting Engineers: Proctor & Redfern, Toronto.

Completed: Contract "A" - December 22.

Expected Completion Date: Contract "B" - January 1965.

Contract "C" - March 1965.

Estimated Project Cost: \$850,000.00.

Contract "B" - Six pumping stations were completed and the seventh was to be delivered about the middle of January, 1965.

Contract "C" - Work progressed slowly. By the end of the year approximately 60% of the work had been completed.

Port Arthur (63-S-156)

Description of Project: McVicar's Creek trunk sanitary sewer.

Consulting Engineers: Gibb, Underwood & McLellan

Completed: November 20.

Estimated Project Cost: \$571,200.00.

Port Dover (62-S-115)

Description of Project: Contract 1 - Sewage treatment plant and pumping station #1.
Final contract cost - #389,990.00.

Contract 2 - Trunk sewers and pumping stations 2, 3 and 4.
Final contract cost - \$242,755.00.

Consulting Engineers: M. M. Dillon & Co. Ltd., London.

Completed: Contract 1 - September 8.

Contract 2 - October 13.

Estimated Project Cost: \$720,000.00.

Rockland (63-S-153)

Description of Project: Installation of 19,300 lin. ft. of sanitary sewers, 2,630 lin. ft. of force main, and two prefabricated pumping stations and the construction of a single-cell lagoon.

Consulting Engineers: J. L. Richards & Assoc. Ltd., Ottawa.

Expected Completion Date: April 1965.

Estimated Project Cost: \$310,800.00.

The work on this project commenced on July 16. The lagoon and forcemain were completed by the end of the year while the sanitary sewers were 80% completed. This system was expected to be in operation by April 1965.

Sault Ste. Marie (63-W-119)

Description of Project: Watermain extension.

Consulting Engineers: Proctor & Redfern.

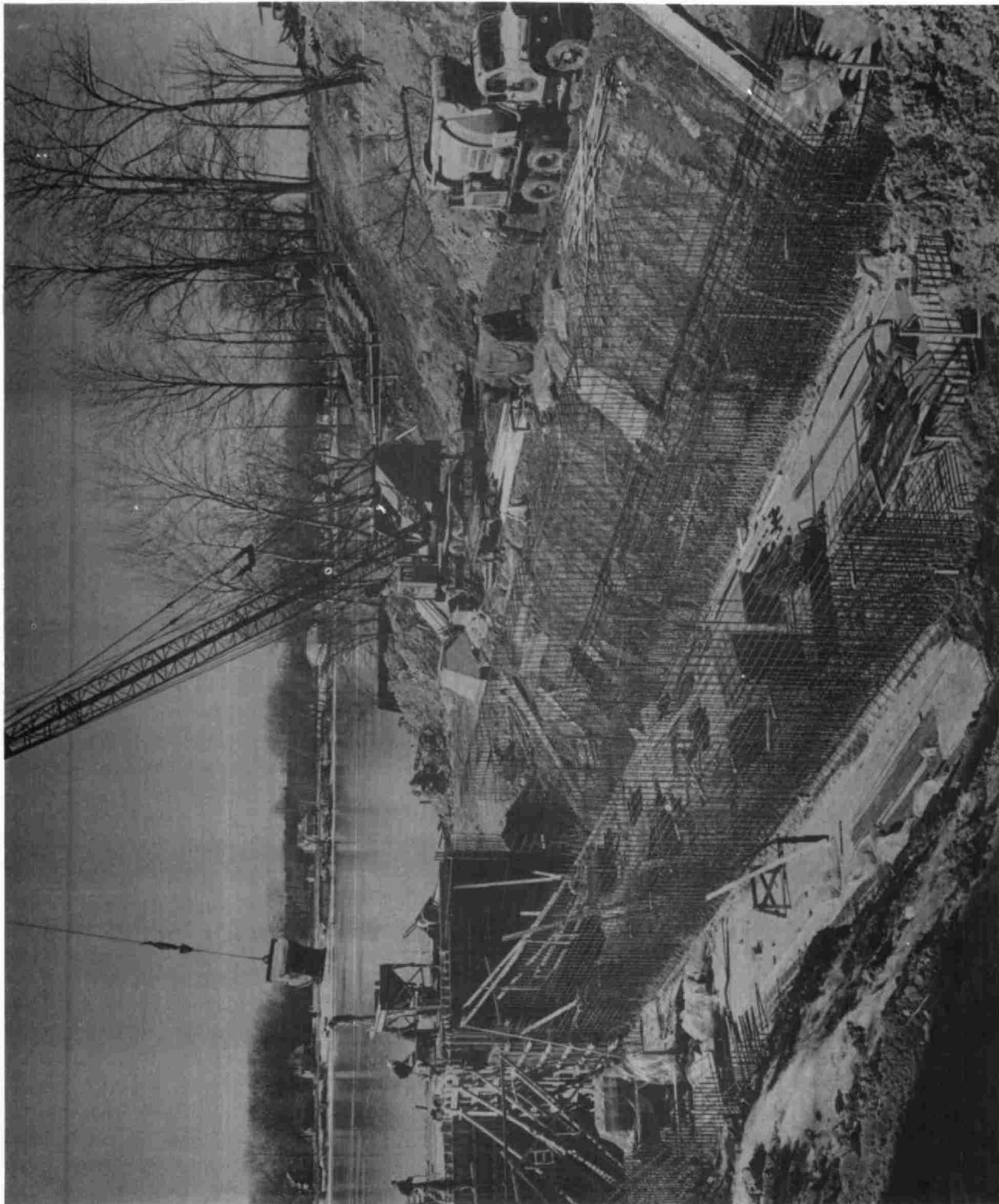
Sault Ste. Marie (63-W-119)

Completed:

September 30.

Estimated Project Cost:

\$557,700.00.



Smithville (Twp. of South Grimsby) (61-S-80)

Description of Project: Sanitary sewers, sewage pumping station, force main and one-cell lagoon.

Consulting Engineers: Douglas G. Ure & Sons, St. Catharines.

Completed: January 8.

Estimated Project Cost: \$361,730.00

Sutton (64-S-171)

Description of Project: Sanitary sewers (extensions to those installed in 1963).

Consulting Engineers: R. K. Kilborn & Associates, Toronto.

Expected Completion Date: May 1965.

Estimated Project Cost: \$44,000.00.

The sewer contract was about half completed at the end of the year. The remaining work was to be started in March or April, 1965.

Richmond Hill (62-W-102)

Description of Project:

- Contract 1 - Drilling and development of #5 deep well. Supply and installation of deep well pump. Final contract cost - \$28,625.00.
- Contract 2 - Installation of raw watermain from #5 well site to Markham Road. Final contract cost - \$29,941.41
- Contract 3 - Construction of pumphouse for deep well #5 and electrical control. Final contract cost - \$15,534.00.

Consulting Engineers: Proctor & Redfern, Toronto.

Completed: Contracts 1 & 2 - August, 1963.
Contract 3 - February 2.

Estimated Project Cost: \$87,000.00.

Township of Saltfleet (62-S-128)

Description of Project: Contract 1 - Blenheim trunk sanitary
sewer.
Final contract cost -
\$237,436.27.

Contract 2 - 66" dia. sanitary trunk
sewer in tunnel.
Final contract cost -
\$246,271.16.

Consulting Engineer: William L. Sears, Township Engineer.

Completed: Contract 1 - September 13, 1963.
Contract 2 - May 22.

Estimated Project Cost: \$545,300.00.

Township of Saltfleet (63-W-128)

Description of Project: Fruitland watermain extensions.

Consulting Engineer: William L. Sears, Township Engineer.

Completed: September 3.

Estimated Project Cost: \$160,200.00.

Township of Tarentorus (62-S-134)

Description of Project: Approximately 12,000 feet of trunk
sewer.

Consulting Engineers: Proctor & Redfern, Toronto.

Completed: March.

Estimated Project Cost: \$144,500.00.

Township of Thorah (63-W-125)

Description of Project: Water distribution system.

Consulting Engineer: T. R. Cooil, Toronto.

Completed: May.

Estimated Project Cost: \$90,000.00.

Thorold (63-S-147)

Description of Project: Sanitary trunk sewer.

Consulting Engineers: James F. MacLaren Ltd., Toronto.

Completed: April 10.

Estimated Project Cost: \$175,000.00.

Timmins (60-S-71)

Description of Project: Contract 1 - Outfall sewer.
Final contract cost -
\$107,752.28.

Contract 2 - Sewage treatment plant.
Final contract cost -
\$613,056.70.

Consulting Engineers: Gore & Storrie Ltd., Toronto.

Completed: Contract 1 - February 23, 1963.
Contract 2 - March.

Estimated Project Cost: \$835,000.00.

Township of Toronto (63-S-145)

Description of Project: Stage II of the Cooksville Creek
sanitary trunk sewer.

Contract 1 - From Q.E.W. to King St.
Final contract cost -
\$199,699.27.

Contract 2 - Deleted from Agreement.

Consulting Engineer: Township Engineer, Township of
Toronto.

Completed: June.

Estimated Project Cost: \$231,000.00.

Township of Whitchurch: (63-W-118)

Description of Project: Water supply system.

Estimated Contract Cost -
\$124,600.00.

Consulting Engineers: Crysler, Davis & Jorgensen Limited,
Willowdale.

Substantially Completed: August 10.

Estimated Project Cost: \$142,250.00.

Construction commenced in April and was substantially completed in October. The works were tested and put into operation in August.

The project was prolonged through tardy work of the contractor in completing restoration.

Wingham (62-S-129 (63-S-139)

Description of Project: Storm sewers, trunk sanitary
sewers, prefabricated pumping
station, force main, lagoon, out-
fall.

Consulting Engineer: B. M. Ross, Goderich.

Substantially Completed: October 7.

Estimated Project Cost: \$337,000.00.

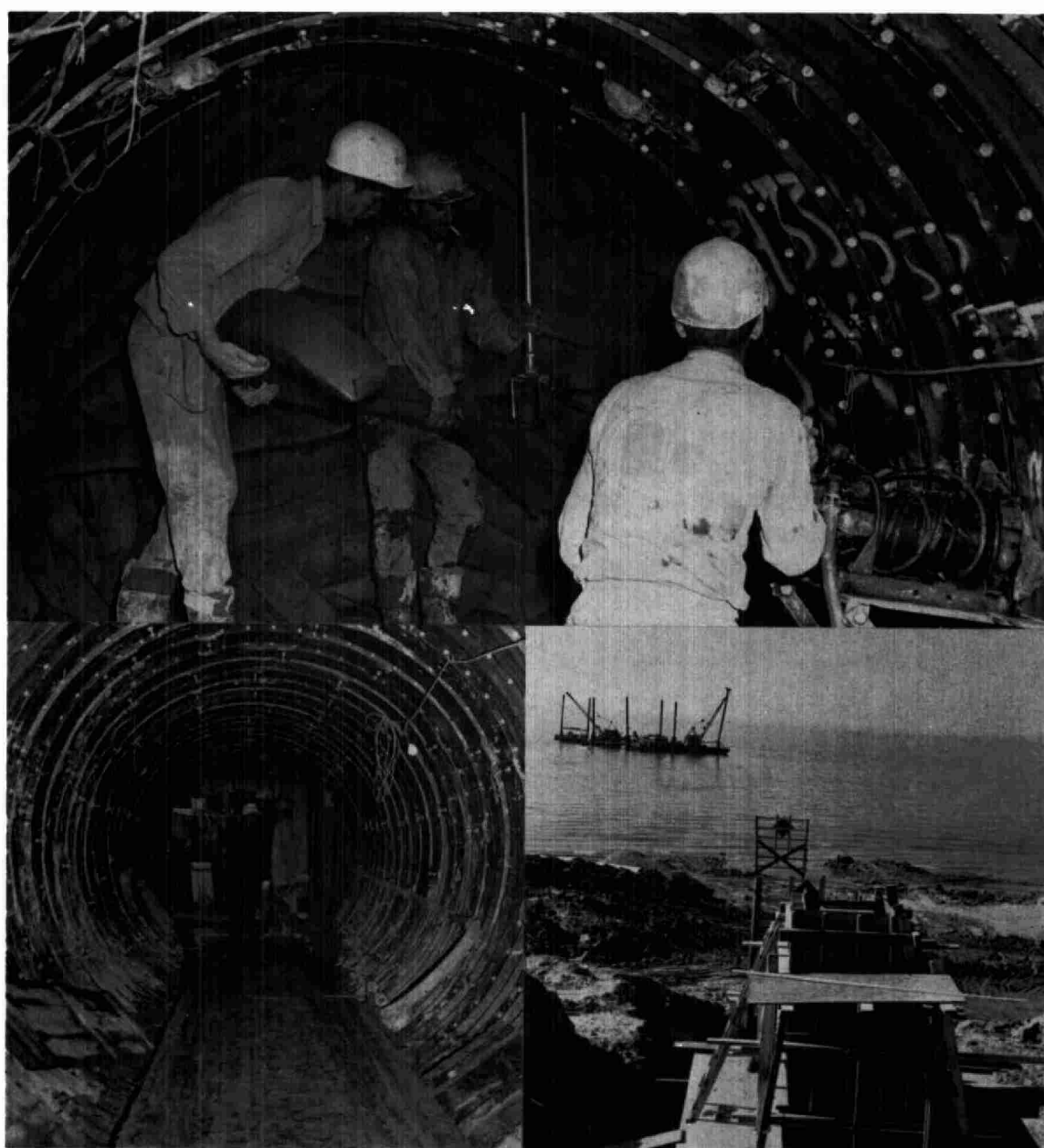
Woodslee (Townships of Gosfield North, Maidstone and Rochester)
(63-W-116)

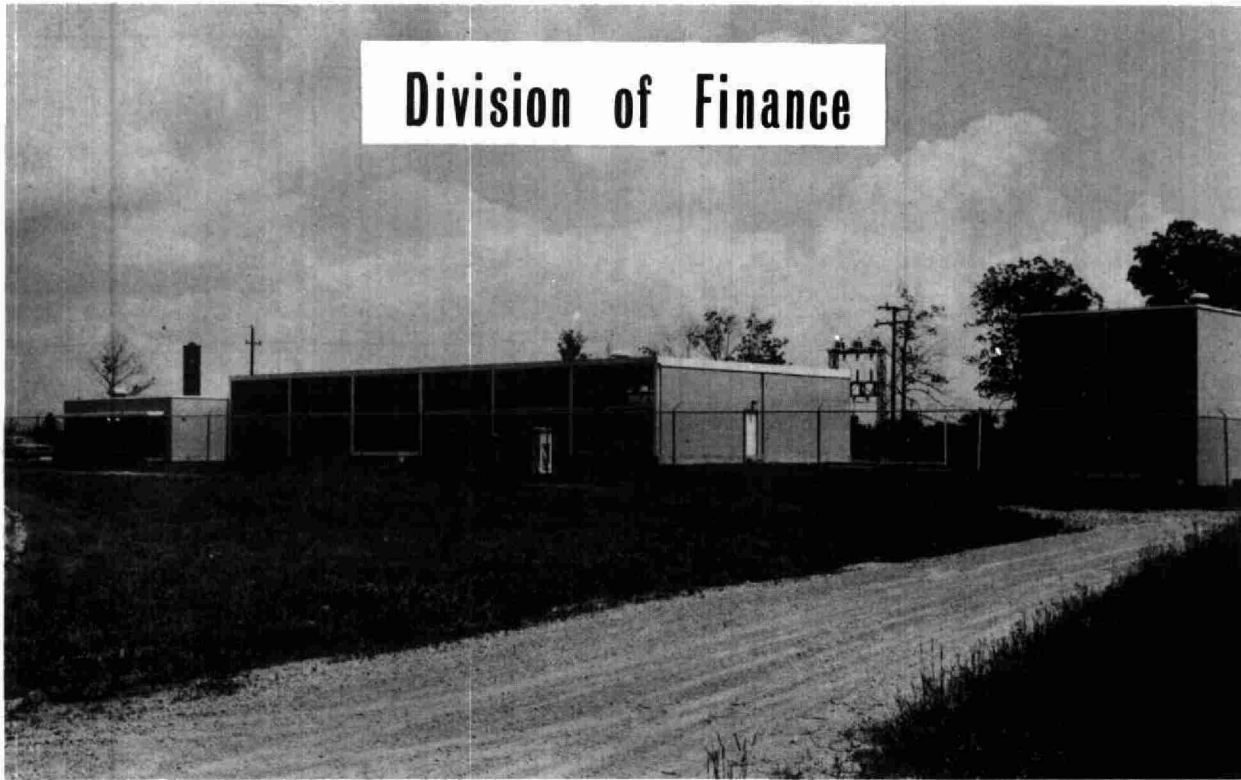
Description of Project: Water feedermain and distribution system.

Consulting Engineers: C. G. Russell Armstrong, Windsor.

Completed: November 13.

Estimated Project Cost: \$191,443.00.





D. A. Joynt, Comptroller
E. F. Heath, Assistant Comptroller

During 1964, the Finance Branch took on division status and continued its efforts to provide a high level of service to municipalities, creditors of the Commission, and the other divisions of the OWRC. Growth in most Commission activities and expansion into new fields required some reorganization within the division, including expansion of staff.

The expansion of most activities of the division and the Commission, are revealed in the following statistics.

(A) Ordinary Vote Expenditures

1961/62	\$ 2,048,721
1962/63	\$ 2,270,256
1963/64	\$ 2,685,955
1964/65	\$ 3,221,600 (Est.)

(B) Gross Capital Expenditures

1961/62	\$15,375,965
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1962/63	\$24,772,603
1963/64	\$21,233,906
1964/65	\$16,000,000 (Est.)

(C) Gross Capital Receipts

	<u>Winter Works Subsidies</u>	<u>Payments from Municipalities C.M.H.C. and Others</u>	<u>Total</u>
1961/62	\$ 624,129	\$ 3,333,727	\$ 3,957,856
1962/63	\$1,550,892	\$10,811,383	\$12,362,275
1963/64	\$1,891,147	\$12,060,099	\$13,951,246
1964/65	\$1,203,000 (Est.)	\$ 8,000,000 (Est.)	\$ 9,203,000 (Est.)

(D) Expenditures in the Operation of Water and Sewage Treatment
Plants

1961	\$1,107,939
1962	\$1,375,787
1963	\$1,829,892
1964	\$2,548,350

(E) Receipts from Billings to Municipalities

	<u>Debt Retirement</u>	<u>Reserve for Contingencies</u>	<u>Interest</u>	<u>Project Operation</u>	<u>Total</u>
1961	\$ 656,312	\$220,244	\$1,833,270	\$1,198,251	\$3,908,077
1962	\$ 960,797	\$345,137	\$2,439,253	\$1,639,612	\$5,384,799
1963	\$1,104,654	\$466,425	\$3,026,561	\$1,998,665	\$6,596,305
1964	\$1,436,669	\$569,489	\$3,732,195	\$2,622,652	\$8,361,005

At December 31st, loans from the Province of Ontario for the purpose of constructing water and sewage projects totalled \$72,319,574 (estimated). The effective rate of interest payable to the Province on this amount was 5.626 per cent or some \$4,068,699 per annum.

During the year, invoices were sent out to municipalities with OWRC projects, in the total amount of \$8,361,005 as follows:

Debt Retirement	\$1,436,669
Reserve for Contingencies	\$ 569,489
Interest	\$3,732,195
Operations	\$2,622,652

The funds received for the debt retirement and reserve for contingency charges were invested by the OWRC Investment Committee in accordance with the requirements of the OWRC Act. The effective rate of earnings on investments made as of December 31st was slightly in excess of 5.5 per cent.

The interest money received from billings was used by the Commission to repay in part the liability of the OWRC for interest on funds borrowed from the Province, while the amount received for operations was used to pay the operating costs of each project. Continued assistance was provided to municipalities by the staff of the Division of Finance in the installation of accounting and billing systems, and the instruction of municipal staff in the maintaining of records.

Payroll and Machine Accounts

The activity of this section continued to increase due to the growth of head office and project operations staff, and the head office and project operation expenditures.

These figures give some indication of the increased activity:

(A) Payrolls

	<u>Number of Staff</u>		<u>Amount Paid</u>	
	<u>Jan. 1, 1964</u>	<u>Dec. 31, 1964</u>	<u>1963</u>	<u>1964</u>
Head Office	341	380	\$1,767,227	\$2,154,032
Project Operations	205	227	\$ 754,310	\$ 936,660

The number of cheques issued for project operations payrolls, increased from 5,267 in 1963 to 6,249 in 1964.

(B) Head Office Expenditures

Expenditures in 1964/65 were approximately \$536,000 higher than in 1963/64.

(C) Project Operation Expenditures

The number of projects increased from 191 at January 1, 1964, to 225 at December 31, 1964. Monthly operating statements were produced for the majority of these projects.

Contract Payments and Records

During the year, this section processed for payment 620 contract certificates totalling \$11,671,542; 416 engineering certificates totalling \$1,166,628 and 1,206 miscellaneous invoices totalling \$1,921,504 for a grand total of \$14,759,674.

Tender calls made during the year amounted to 40 while during the same period, 40 contracts were awarded in the total amount of \$10,094,756.73.

Subsidies in respect of the 1963/64 Winter Works Program were made on behalf of 37 municipalities, with 42 claims being filed for an estimated subsidy of \$983,901.93. Also, applications were made for a rebate of Provincial Sales Tax on behalf of 61 projects in the total amount of \$290,340.

Purchasing Section

An increase in the number of Commission water and sewage projects in operation and continued growth of Commission activities resulted in an increase of 18 per cent in purchase orders issued in 1964 over the 1963 figures.

Number of Purchase Orders Issued

	<u>1962</u>	<u>1963</u>	<u>1964</u>
Head Office Purchases	1,300	2,150	2,474
Project Operation Purchases	2,282	3,010	3,578
Project Construction Purchases	<u>805</u>	<u>905</u>	<u>1,167</u>
	<u>4,387</u>	<u>6,110</u>	<u>7,219</u>
<u>Increase</u>	<u>11%</u>	<u>39%</u>	<u>18%</u>

ONTARIO WATER
(CONSTITUTED BY SPECIAL ACT)

BALANCE

AS AT

ASSETS

CAPITAL ACCOUNT

CASH IN BANK	\$ 799,895.06
RECOVERABLE ADVANCES	29,546.91
ACCOUNTS RECEIVABLE	3,504,571.37
CAPITAL ASSETS:	
COMPLETED PROJECTS OWNED BY ONTARIO WATER RESOURCES COMMISSION	54,186,316.77
CAPITAL ADVANCES FOR COMPLETED PROJECTS OWNED BY MUNICIPALITIES	18,041,078.19
CONSTRUCTION IN PROGRESS	3,767,753.85
AMOUNTS DUE FROM RESERVE ACCOUNT	14,954.68

\$80,344,116.83

RESERVE ACCOUNT

CASH IN BANK	\$ 36,239.36
ACCRUED INTEREST RECEIVABLE	18,019.88
INVESTMENTS, AT AMORTIZED VALUE (MARKET VALUE \$1,867,865.63)	<u>1,843,318.41</u>
	\$ 1,897,577.65

DEBT RETIREMENT ACCOUNT

CASH IN BANK	\$ 42,153.08
ACCRUED INTEREST RECEIVABLE	67,196.65
INVESTMENTS, AT AMORTIZED VALUE (MARKET VALUE \$4,899,602.50)	4,840,387.02
AMOUNTS DUE FROM CAPITAL ACCOUNT	<u>12,148.29</u>
	\$ 4,961,885.04

\$87,203,579.52

RESOURCES COMMISSION

OF THE ONTARIO LEGISLATURE)

SHEET

DECEMBER 31, 1964

LIABILITIES

CAPITAL ACCOUNT

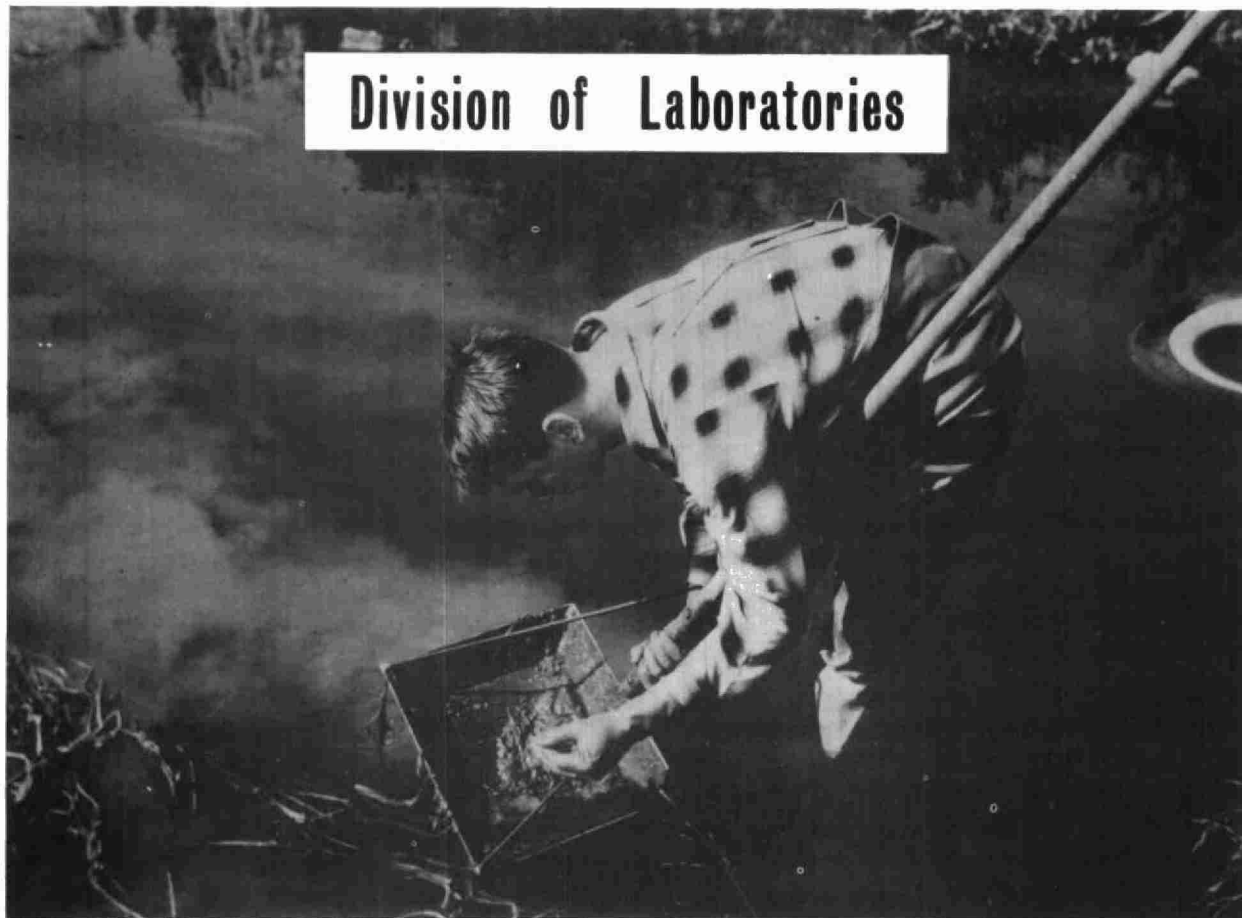
ACCOUNTS PAYABLE AND CONTRACT RETENTIONS			\$ 2,839,168.38
ADVANCES FROM MUNICIPALITIES AND OTHERS			
OPERATING AND INTEREST		\$ 981,318.76	
CAPITAL		<u>4,159,214.31</u>	5,140,533.07
DUE TO PROVINCE OF ONTARIO			
TREASURY DEPARTMENT ADVANCE			35,000.00
FUNDED DEBT PAYABLE TO THE PROVINCE OF ONTARIO			
1957 ADVANCES, MATURING DECEMBER 31, 1987	5.50%	\$ 659,670.88	
1958 ADVANCES, MATURING DECEMBER 31, 1988	4.75%	7,502,389.38	
1959 ADVANCES, MATURING DECEMBER 31, 1989	5.90%	11,957,869.44	
1960 ADVANCES, MATURING DECEMBER 31, 1990	6.05%	13,979,335.39	
1961 ADVANCES, MATURING DECEMBER 31, 1991	5.62%	11,854,332.25	
1962 ADVANCES, MATURING DECEMBER 31, 1992	5.55%	13,403,821.26	
1963 ADVANCES, MATURING DECEMBER 31, 1993	5.71%	10,327,376.65	
1964 ADVANCES, MATURING DECEMBER 31, 1994	5.60%	<u>2,632,471.84</u>	72,317,267.09
AMOUNTS DUE TO DEBT RETIREMENT ACCOUNT			<u>12,148.29</u>
			\$80,344,116.83

RESERVE ACCOUNT

FUNDS FOR RENEWALS, REPLACEMENTS AND CONTINGENCIES			
UNDER SECTION 43 OF THE ACT			\$ 1,882,622.97
AMOUNTS DUE TO CAPITAL ACCOUNT			<u>14,954.68</u>
			\$ 1,897,577.65

DEBT RETIREMENT ACCOUNT

SINKING FUND FOR THE RECOVERY OF THE COST OF CAPITAL			
ASSETS AT ¹⁴ / ₃₄ UNDER SECTION 44 OF THE ACT			\$ 4,961,885.04
			<u>\$ 4,961,885.04</u>
			\$87,203,579.52



F. A. Voegel, Director
R. H. Millest, Assistant Director

As was expected, determinations made on samples during 1964 increased over the number carried out in 1963. The increase amounted to 8.4 per cent, a most significant rise which presented a factual picture of the analytical work load placed on the laboratories, particularly the Chemistry Branch Laboratory. This increase occurred despite a decrease in the total samples received by the division.

In 1963, personnel of the Purification Processes Branch collected and analyzed many samples while working on a research project at Chatham. Since that time, the Division of Research assumed these duties and the samples handled and determinations made by the Purification Processes Branch decreased while those of the Biology and Chemistry branches increased. However, increases in the Chemistry and Biology determinations, of 22.7 and 62.3 per cent, respectively, were offset by decreases of 6.7 and 45.9 per cent in this work in the Bacteriology and Purification

Processes branches, respectively, as shown in the following table.

<u>Branch</u>	<u>No. of Samples</u>		<u>No. of Determinations</u>	
	<u>1963</u>	<u>1964</u>	<u>1963</u>	<u>1964</u>
Bacteriology	20,385	22,603	40,259	37,581
Biology	522	1,086	1,217	1,975
Chemistry	26,187	27,661	118,809	145,806
Purification Processes	8,503	*706	21,395	11,556
TOTALS -	<u>55,597</u>	<u>52,056</u>	<u>181,680</u>	<u>196,918</u>

* Laboratory samples only.

The fact that fewer determinations were carried out by the Bacteriology Branch was due to the loss from staff of one scientist who had done most of the nuisance organism identifications. As a result of this resignation, this work had to be curtailed until another graduate bacteriologist could be recruited and trained.

Although the analytical work was an important segment of the responsibility of the division, the Biology, Industrial Wastes and Purification Processes branches engaged in intensive and extensive field studies. Investigations, surveys, and evaluations were carried out by these branches wherever necessary to preserve the quality of the water and reduce pollution to a minimum. To this end, a greater number of reports on these activities were prepared by these branches in 1964 than in any previous year.

The report on the Reconnaissance Survey of Radiological Pollution in the Serpent River Watershed by personnel of the Biology and Industrial Wastes branches was completed during the year. Division staff took part in many of the preliminary meetings arranged with other government departments and, at the end of the year, was still involved in discussions concerning the situation and the solving of any attendant problems.

Pollution of the surface waters of the Province caused by the loss of oil, whether it be from municipalities, industries or shipping, created many problems and appeared to be on the increase. It was a difficult problem--since it was difficult to trace sources of such losses unless they occurred in certain confined areas or unless a specific type of oil could be traced to a certain source. The Chemistry Branch has assisted the Federal Department of Transport in three cases involving the loss of oil which were successfully prosecuted during the year. It was hoped

that the resultant publicity would cause other users to institute proper safeguards in using oil or in the handling of oil wastes.

The tempo of industrial waste work was stepped up by increased attention to the numbers and magnitude of the problems associated with the discharge of industrial wastes. Although greater attention was directed toward the problems of all types and sizes of industry, initial emphasis was placed on the difficulties caused and experienced by the pulp and paper industry. Meetings were held with various companies and the policies of the Commission in this regard were explained.

Members of staff of various branches of the division participated in the presentation of scientific papers, public lectures and other talks and provided demonstrations for many groups which toured the laboratories building. Lecture and demonstration assistance was given various OWRC course projects.

BACTERIOLOGY BRANCH

The International Joint Commission

A report was prepared for a meeting of the Technical Advisory Board of the International Joint Commission held early in February, giving an account of the 1963 Niagara River Survey Program. This dealt with the densities of total coliform, fecal coliform, enterococcus bacteria and phenol concentrations and meteorological conditions at the mouth of the Niagara River. This was the most extensive field project undertaken by the branch.

The 1964 Niagara River monitoring program commenced in June, and nine surveys were made during the year and data collected in a manner similar to the 1963 program. Through the survey period samples also were collected immediately below Niagara Falls and in Lake Ontario one mile from the mouth of the river. Some of these surveys were conducted with the co-operation of the U.S. International Joint Commission field unit located at Buffalo, N.Y.

An interim report was prepared for the I.J.C. meeting held in the first week of August and a final report was being prepared in December. The data were being analysed statistically by computer, through the co-operation of personnel of the University of Toronto.

Projects

A study to identify the taste and odor-producing substances

in water, attributed to actinomycetes, started in January and had to be curtailed in June as a result of the resignation of the bacteriologist assigned to the project. Better and faster methods for determining densities and types of actinomycetes in water, a culture collection of approximately 50 water actinomycetes, and the isolation, from mass actinomycete cultures, of some of the taste-producing compounds and their partial identification (through co-operation of the Chemistry Branch) were the fruits of this project. The project was to be resumed when a suitable replacement for this bacteriologist could be obtained.

The disinfectant properties of potassium permanganate were studied at the request of the Purification Processes Branch. For comparison purposes chlorine was used in the experiment at the same concentrations as potassium permanganate. After three months' work it was concluded that potassium permanganate had germicidal properties at concentrations suitable for application in water treatment systems but the reduction in bacterial densities was not as pronounced as when the same concentration of chlorine was used.

The enumeration of fecal coliform organisms could, in some instances, help to define the type of pollution in water. To develop a routine test several experiments were undertaken to compare the productivity of the commonly used E. coli Most Probable Number media and these were applied to the Membrane Filter technique. In the first phase of this work, the productivity of four coliform broths was compared. While testing these broths, the distribution of coliform types, according to their temperature tolerances, also was determined. Niagara River and Humber River samples were utilized, giving at the same time valuable basic information about these rivers.

The organisms E. coli and A. aerogenes were found to be more predominant at the elevated temperatures and were indicative of fecal pollution. In most E. coli tests, both of these organisms were observed and the analysis would be better termed a "Fecal Coliform" test. In the development of suitable tests for fecal coliform bacteria using the membrane filter, a comparison of the growth of pure cultures indicated good response to a MacConkeys Membrane Filter broth. Following initial success with this growth medium, a practical period of testing was underway. The test was applied to some routine samples.

In July, a medium for fecal coliform detection became available from the R. A. Taft Sanitary Engineering Centre, Cincinnati. This medium was tested in parallel with the MacConkeys broth

using the Membrane Filter technique. Sufficient data was expected to be accumulated by the spring of 1965 at which time a decision would be made regarding which of the two nutrient substances should be used routinely for fecal coliform enumeration.

Variation in Results

A project, started in 1963, was completed in 1964 delving into the cause of minor variations in routine coliform results. This never-ending problem in bacteriological quantitative analyses was minimized when the main laboratory factors affecting the results were found to be the dilution technique and the counting procedure used. These two factors were examined closely and more standardized practices were introduced. This study pointed again to the main contributing errors in bacteriological determinations--the method of sample collection and the time delay between collection and sample analysis. After six hours the bacterial population in a collected sample would either increase or decrease according to the nutrients in the sample bottle.

Samplers

A battery-operated, solenoid-actuated bacteriological depth sampler capable of collecting a sterile sample at a depth of 100 feet was devised and built. In initial tests the sampler was found to work satisfactorily but when field tested some defects in the mechanism were discovered. Some of these were corrected and the sampler was again available for limited use. It was hoped, that once perfected, others would be manufactured as need arose.

Sulphate-Reducing Organisms

A laboratory paper dealing with the methods of identifying sulphate-reducing bacteria, their effects on environment, their economically important activities and methods of controlling their growth was prepared during November and December. It was to be used routinely for sulphate-reducing organism identification.

Changes in Routine Identification Work

A better method for fecal coliform identification and enumeration was introduced in the latter part of the year for samples of non-specific needs and was to be used routinely for samples in 1965. Most Probable Number determinations were reduced to a minimum and completely supplanted by the Membrane Filter method for detecting coliform organisms. Through the standardization of several steps in the routine coliform method, notably better dilution techniques and more standardized counting procedures, more precise

results were obtained.

Field Work and Lectures

Taste and odor and contamination problems in the water systems of Aurora and Brantford, respectively, were investigated. The Bay of Quinte water productivity study of the Department of Lands and Forests was assisted by the Commission's Biology and Bacteriology branches.

Litigation

Technical evidence was prepared for possible litigation in six pollution cases. Two of these were brought to trial and valuable experience, which could possibly be applied to future litigation proceedings, was gained. The need for close scrutiny of all procedural details from sampling to reporting was evident. To this end, deficiencies such as unchilled and improper sample bottle containers and absence of local laboratory facilities made the collection of evidence and proper appraisal of results difficult. Some of these could be easily corrected, but the problem of long distances and subsequent delays resulting in deterioration of sample quality remained.

Virus

The number of requests for viral studies in drinking water, recreational waters, streams and lakes and in monitoring various waste treatment processes, particularly oxidation ponds, increased in 1964, and indicated that some monitoring facilities would be required by the division in the future. The techniques involved, though very much like bacteriological procedures, could not be performed in a bacteriological laboratory and would require separate facilities. It was evident from the literature that studies in virology were proceeding rapidly in other areas but lagging sadly in the water and wastewater fields.

Two activities under the jurisdiction of the branch served all branches of the division. These were glassworking and glassware washing services. More than 220,000 pieces of glassware were handled, 65,000 of which were sample bottles and the remainder laboratory glassware. Over 242 pieces of glassware were repaired or constructed. Eighty of these were major items which ordinarily would have required replacement or outside repairs.

Sample Numbers

The activities of the branch, which could be partially expressed by numbers of samples and determinations, are summarized on subsequent pages to indicate principally the routine workload of the year 1964. Numbers of determinations are a better index of workload since several may have been conducted on one sample. The time required to perform each analysis varied greatly and could not be taken into consideration by these figures.

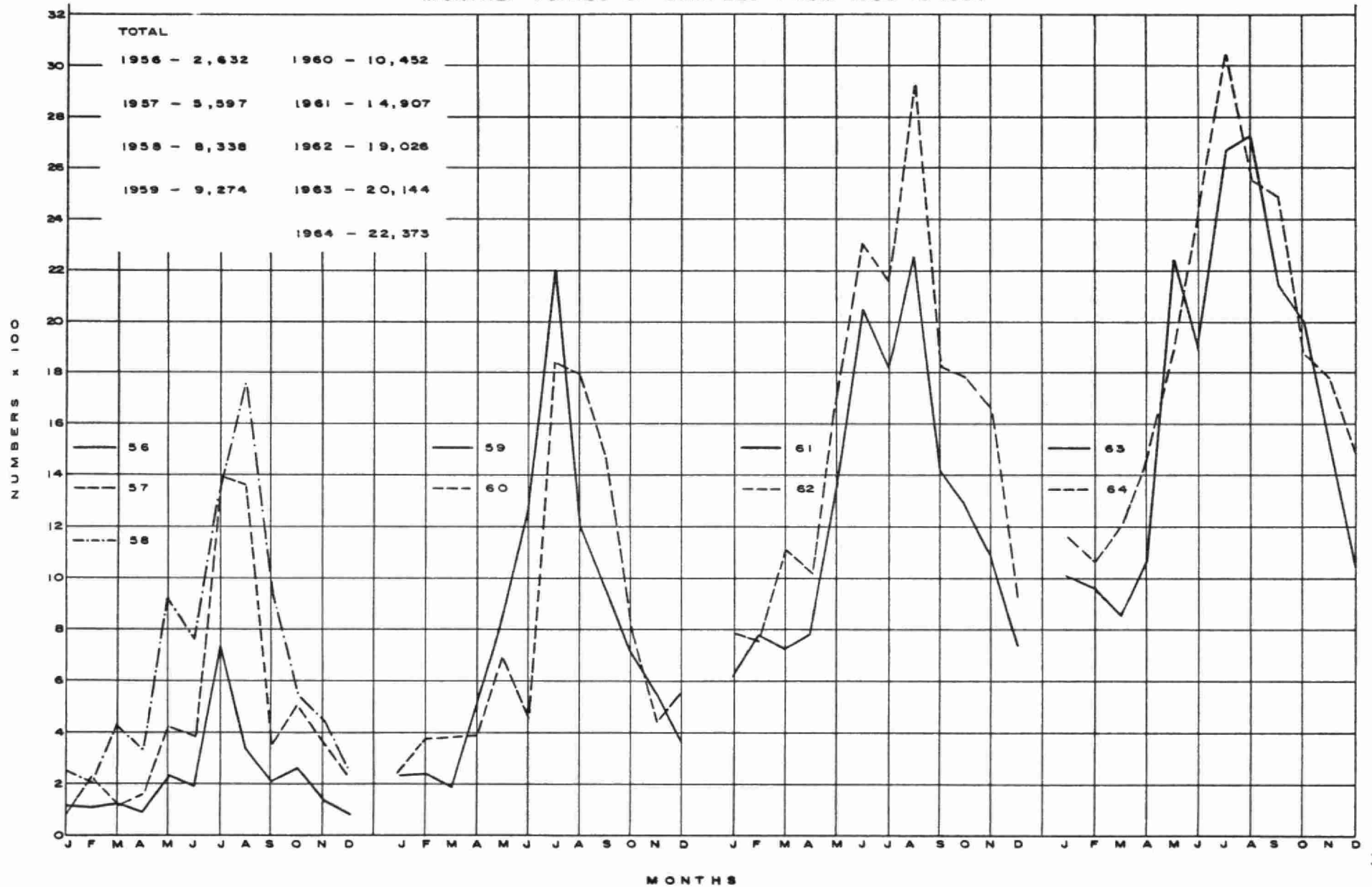
Sample numbers increased by 11 per cent over 1963 submissions, the result of the Division of Sanitary Engineering's efforts to have all municipal water systems examined bacteriologically according to the Ontario Water Resources Commission recommendations (Table I). The total number of determinations fell by 7%. (Tables I & III)

The distribution of sample submissions in 1964 was generally the same as in 1963 except for an increase in the division of Sanitary Engineering samples. (Table II)

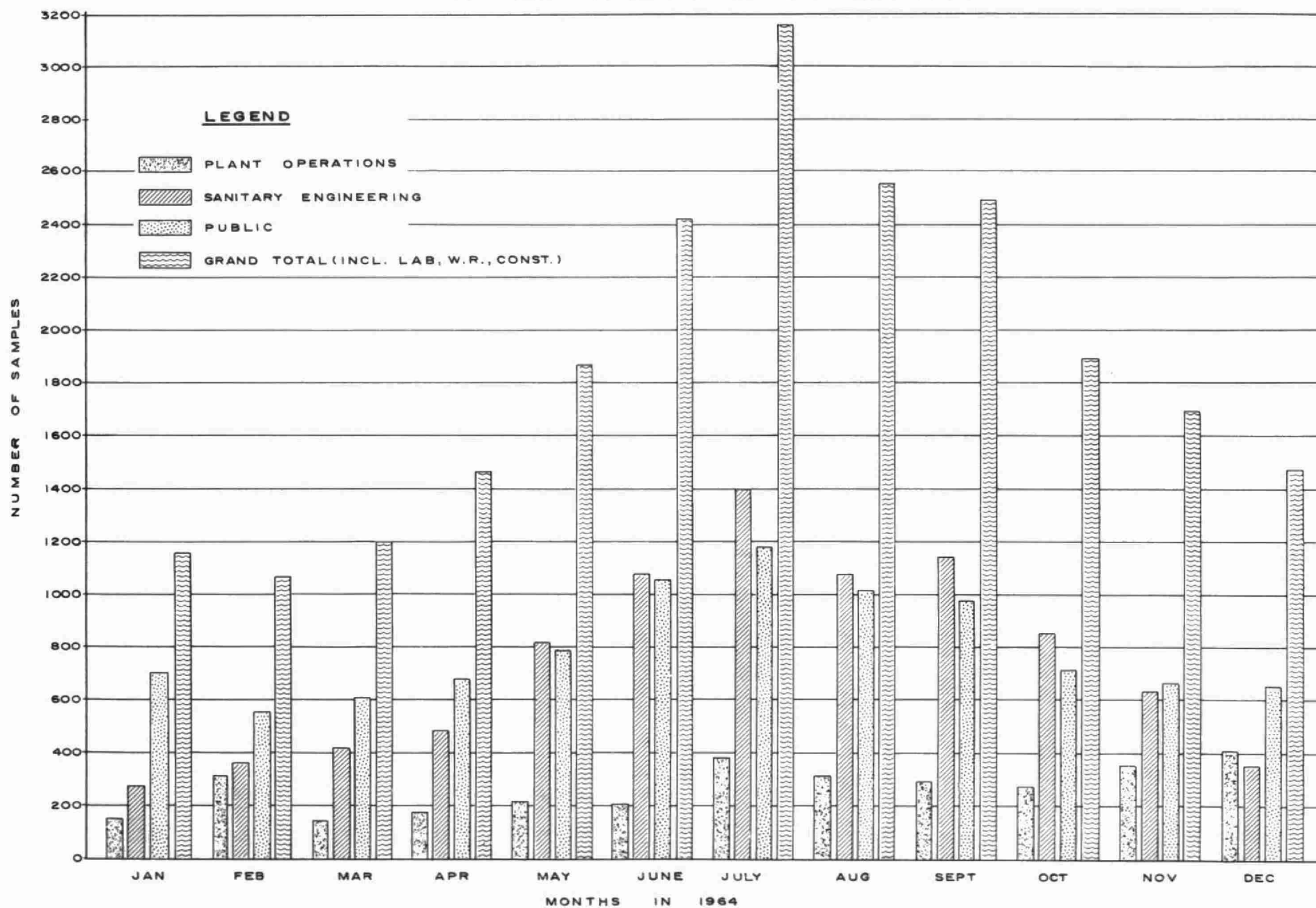
Graph I indicates the trend towards increased sample submissions in the spring and autumn months. Graph II represents monthly total numbers of samples received from the divisions of Sanitary Engineering and Plant Operations and the public, together with the monthly totals of all samples received. Graph III reveals the daily fluctuations in flow of samples.



GRAPH I BACTERIOLOGY
MONTHLY TOTALS OF SAMPLES FROM 1956 TO 1964



GRAPH II — BACTERIOLOGY
MONTHLY NUMBERS OF SAMPLES 1964



GRAPH III BACTERIOLOGY

FREQUENCY DISTRIBUTION OF DAILY SAMPLES IN JULY 1964

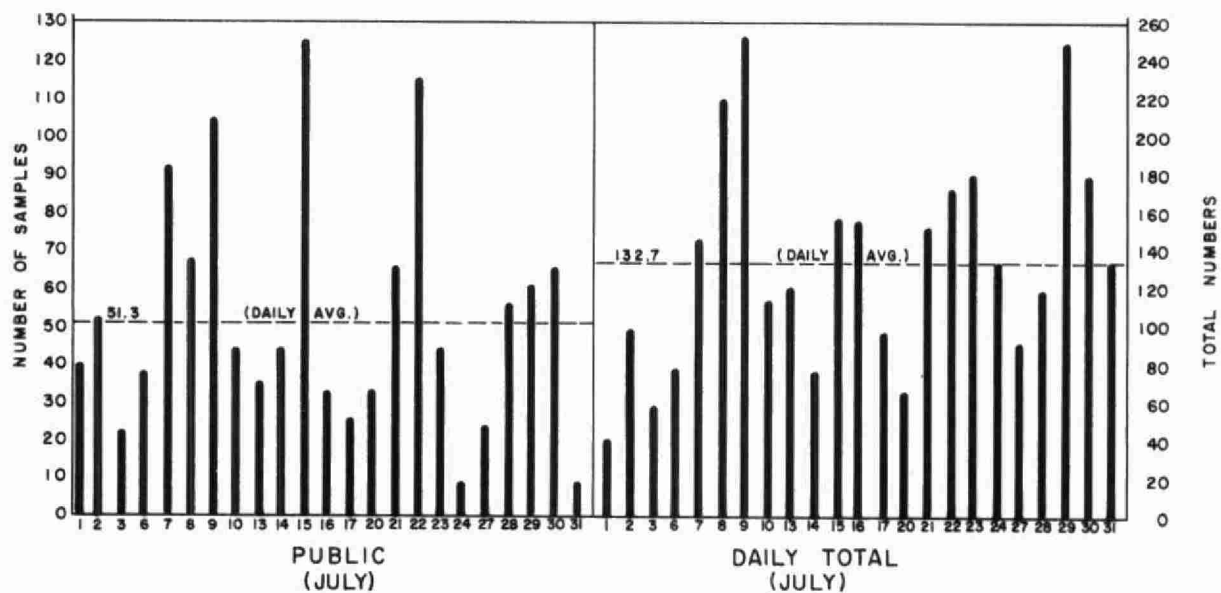
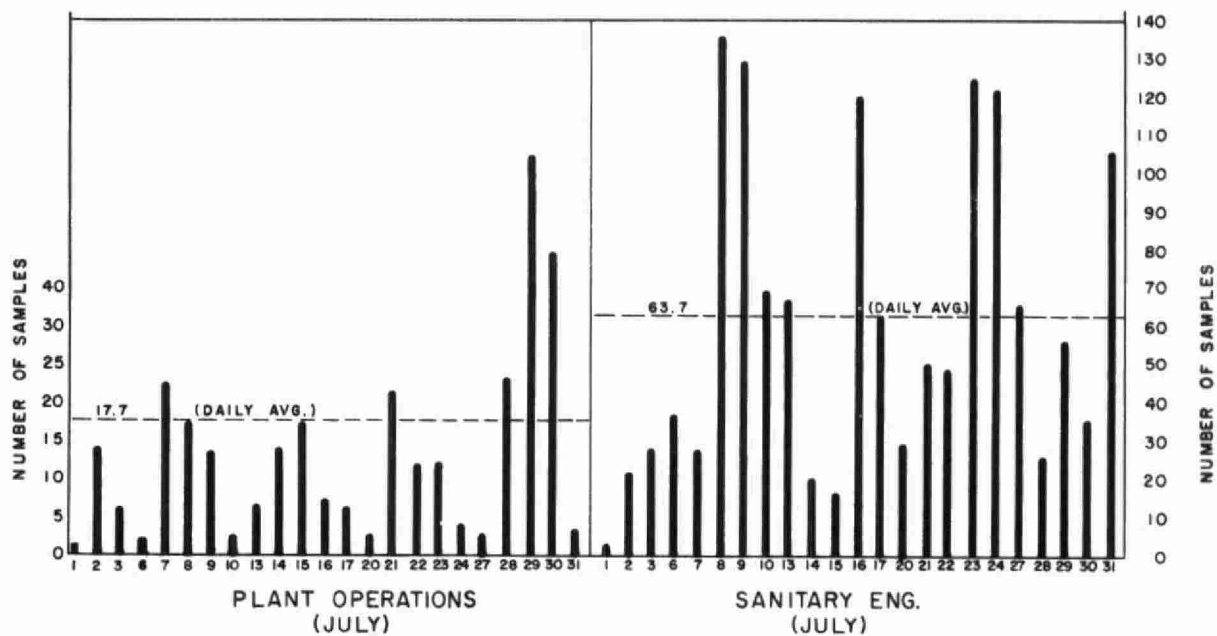


TABLE I

COMPARISON OF SAMPLES ANALYZED IN 1963 & 1964

	<u>1963</u>	<u>1964</u>	<u>Percentage</u>
Total Samples	20,385	22,603	+ 10.88%
Water Samples	12,322	13,877	+ 12.62%
River Samples	4,191	4,248	+ 1.36%
Sewage Samples	3,909	4,248	+ 8.67%
Other Samples	254	230	- 9.45%
OWRC Collected Samples	9,708	12,738	+ 31.21%
Non-OWRC Collected Samples	8,841	9,635	+ 8.98%
Determinations	40,259	37,581	- 6.65%

TABLE II

PERCENT DISTRIBUTION OF SAMPLE SUBMISSIONS 1963 and 1964*

	<u>1963</u>	<u>1964</u>
Public	52.4%	43.1%
Sanitary Engineering Division	34.1%	40.0%
Plant Operations Division	9.1%	13.7%
Laboratories Division	4.0%	2.4%
Water Resources Division	0.3%	0.8%
Construction Division	0.1%	0.02%

*Excludes Nuisance Organism Samples

TABLE III

<u>DETERMINATIONS</u>	<u>1963</u>	<u>Percentage of Total</u>	<u>1964</u>	<u>Percentage of Total</u>
Membrane Filter Coliform	21,188	52.6%	23,518	62.6%
Most Probable Number Coliform	531	1.3%	362	0.9%
Fecal Coliform	322	0.8%	253	0.7%
Indicated Number of Coliforms	---	---	---	---
Slides	239	0.6%	109	0.3%
Plates	1,951	4.9%	1,759	4.7%
Non-routine Analyses	16,028	39.8%	11,580	30.8%
TOTALS	40,259	100%	37,581	100%

TABLE IV

DISTRIBUTION OF NON-OWRC SUBMITTED SAMPLES
43.1% of TOTAL SAMPLES*

<u>AGENCY</u>	<u>1963</u>		<u>1964</u>	
	<u>Percentage</u>	<u>No.</u>	<u>Percentage</u>	<u>No.</u>
Water and Sewage) Pollution Control Plants) (P.U.C. Included)**)	48.1	5,083	62.0	5,978
Armed Forces	4.7	499	5.6	539
Dept. of Highways)	1.0	104))
Ontario Hydro	0.1	14)	24.7%	432)
Ontario Hospitals	0.7	68))14.4%
Others	22.9	2,414)	9.9	953)
Dept. of Lands and) Forests and) Conservation Agencies)	8.3	878)	6.0	581)
)22.5%)18.0%
Medical Officers of) Health)	14.2	1,494)	12.0	1,152)
**Water - 5,666 Sewage - 312				

* Excludes Nuisance Organism Samples

BIOLOGY BRANCH

In 1964 the Biology Branch intensified its studies on the effects of pollution on life in water, worked on the problem of radiological pollution in the Serpent River system, established programs for eight municipalities to evaluate the biological quality of proposed water supplies, carried out research on the algae *Cladophora* and on methods for the control of aquatic nuisances. These and other studies were directed toward advancing the Commission's objectives for the control of pollution and the supply of potable water throughout the Province.

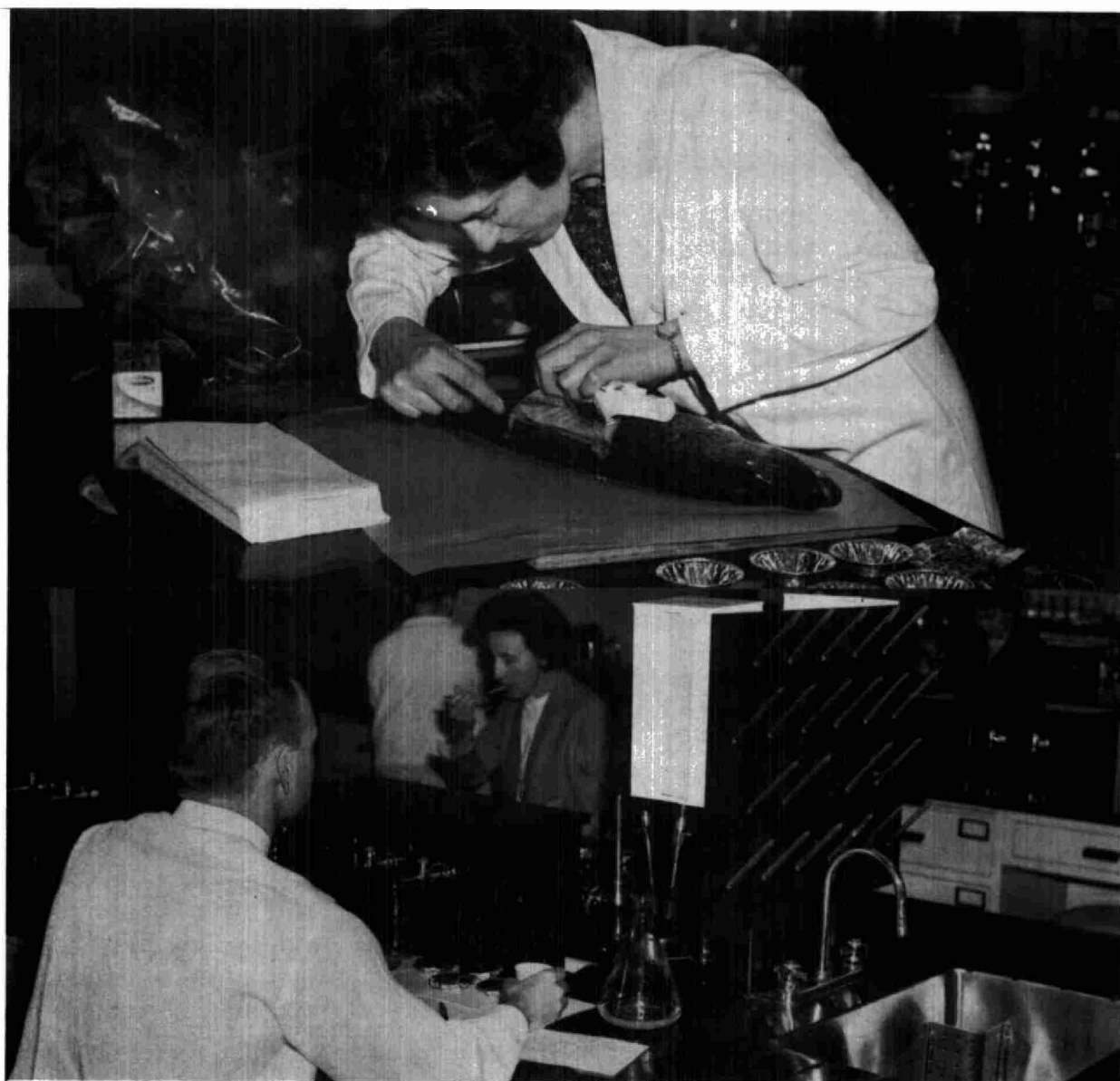
In June a biologist was employed to work exclusively on biological surveys. Detailed studies were made on the effect of pollution on life inhabiting the waters of the Welland River, Hamilton Bay and Duffin Creek. Other surveys in less detail were carried out on the Spanish River, Etobicoke Creek, the Serpent River and the Crowe River. An assessment of the effect of pollution on the waters receiving waste was very important, as this information would identify the specific problem created and delineate the areas most seriously affected. It also could be used to measure the beneficial effects of pollution control measures instituted. Detailed studies were planned on 10 watercourses for 1965.

The report of the Reconnaissance Survey of Radiological Pollution in the Serpent River Watershed was completed in co-operation with the staff of the Industrial Wastes Branch in 1964. The report showed concentration of radioactive components by certain biological forms. Further biological collections were made in both the Serpent River and Crowe River systems for radioactive analyses and these findings were to be reported in 1965.

The aquatic plant and algae section of the branch undertook a number of programs for the evaluation of raw water quality for proposed municipal water supplies. Samples of raw water were being received at the year-end for evaluation on a regular basis from the Lake Huron Water Supply System, Owen Sound, Meaford, Bobcaygeon, Gravenhurst, Bracebridge, Township of West Ferris and Bath and a final report was prepared on the proposed source of water for Cache Bay. Algae conditions which would lead to water problems were found in several of the proposed sources. Detailed studies of water quality problems were carried out in co-operation with the Purification Processes Branch at Belleville and Espanola. Excessive growths of algae and aquatic plants which promote serious nuisance problems often occur as a result of the fertility imparted to water by certain kinds of pollution. Investigations of this type of problem were carried out in the Bay of Quinte,

Mississippi Lake, Moira Lake and Toronto Harbor.

The effectiveness of several chemicals in controlling snails which harbor the organism responsible for swimmers' itch was studied in the field. Though additional information on the control of this problem was obtained, the most effective molluscides were found to be highly toxic to fish. Another field study was conducted on the effectiveness of light exclusion as a means for controlling aquatic plants. Large sheets of black plastic were obtained and floated over weed beds in a number of locations. It was found that the growth of plants was restricted for the season when the bed was covered for a period of 20 days. Under certain circumstances, this method of control could replace the use of chemicals in water.



Studies which were started in 1963 on the effect on the taste of fish by wastes from certain paper mills were continued. A procedure was developed for an evaluation of the palatability of the fish flesh using a panel of staff members and the results demonstrated that fish of several species had been affected over a number of miles in the river. Further studies, in co-operation with the industry, were underway involving the testing of fish exposed to various fractions of paper mill wastes in order to determine the specific source of compounds responsible for the development of the taste.

A number of special projects of interest were undertaken during the year. Because of scuba diving ability of some members of branch staff, a request was made for an inspection and repair of the OWRC sampling pipe installed in Lake Huron at Grand Bend. The inspection and necessary repairs were carried out over a distance of two miles on this line. A display for the OWRC exhibit at the CNE which depicted the difference in the forms of life which inhabited clean water and polluted water was prepared and maintained.

The Biology Branch maintained a continuing program of training water works operators to count algae. The information derived from these analyses was used in the operation of the plant and also was provided to the Commission for its records. As no long term records of algae conditions were available from any waters of the Province, this information from key locations, 12 at the year-end, was providing valuable information which could be used in measuring long-term changes in algae populations and for evaluating these waters as potential sources for municipal water supplies. In this connection, one week's course of instruction was provided during the year and a newsletter, called the "Algae Counters' Review," was prepared and sent to co-operating municipalities.

The Branch had the responsibility for the screening of applications for the preparation of Commission permits for the use of chemicals for the control of aquatic nuisance problems in public waters. The total number issued in 1964 was 54, five less than the previous year. While the number of permits issued was not high, the public was becoming aware that information was available from the OWRC on the methods for controlling such nuisances as aquatic plants and algae, swimmers' itch, aquatic insects and coarse fish. A growing number of inquiries was being handled each year. As an indication of the number of requests received, 5,000 copies of the OWRC booklet, "Aquatic Plant and Algae Control", were given out during 1963 and 1964.

Fish kills in the Province continued to be investigated by several branches of the Commission and by the Department of Lands and Forests. The following table summarizes the information collected for 1964.

TABLE I

<u>Cause - (known or suspected)</u>	<u>No. of Kills</u>
Industrial Wastes	11
Pesticides	3
Domestic Pollution	2
Natural Causes	2
Unknown	7
Total	<u>25</u>
*Total for 1963 -	20

Note---Game fish species were killed in 12 of the 25 kills investigated.

Biological analyses continued to be an increasing part of the work of the branch, with some samples derived as a result of field work by branch staff, from other divisions of the Commission, and from public sources (Table III). During the year the number received was twice that of 1963.

TABLE II

Summary of Samples Received (1964)

Algae counts	485
Biological identification and analyses	435
Bio-assay	<u>166</u>
Total	<u>1,086</u>

*Total 1963 - 522

TABLE III

Sources of Samples Received

Biology Branch	567
Research Division	95
Plant Operations	33
Sanitary Engineering	138
Other OWRC	16
Other Government & Municipal Agencies	177
Public	<u>60</u>

Total 1,086

The staff of the Biology Branch in 1964 consisted of four biologists and one technician. The work of one staff biologist was directed almost exclusively to work on the Cladophora Research Project at the Division of Research.

CHEMISTRY BRANCH

The year 1964 was one of record analytical production. Innovations which assisted in setting new records included the use of a six-day-per-week schedule for performing BOD tests during the peak seasons, and the acquisition of additional casual employees who were to assist in completing work during the fall season.

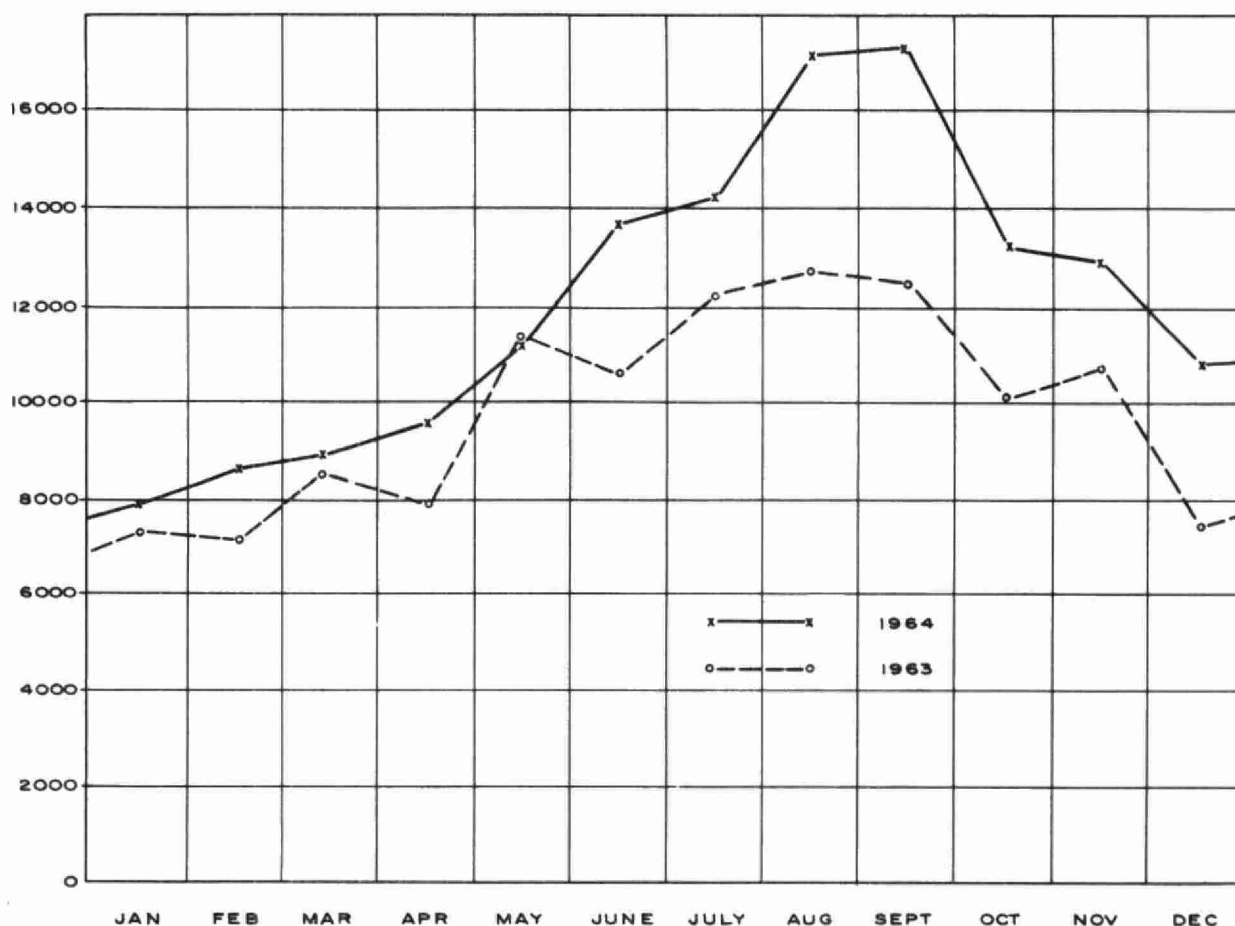
The tabulation of production through the year is contained in the graph on a subsequent page. This illustrates the new peak output records set in August and September, as well as the less obvious increase of 46 per cent in December. An overall increase of 23 per cent in work performed was recorded at the year's end.

This mathematical comparison, however, failed to reveal entirely the situation. During July, a backlog of more than 1,000 uncompleted analyses developed but this was overcome during the fall with the assistance of the additional casual employees. As tests per sample continued to rise, a review of these cumulative increases revealed that the additional tests were concentrated among only some of the determinations performed, rather than occurring as a general increase among all types of tests. Those tests increasing most abruptly were those of more than average difficulty. Thus, the 23 per cent cumulative increase during the year was work requiring more than the average expenditure of effort and care. Prominent among those tests showing the greatest increase were tests for anionic detergents (187%) and phosphates (166%).

These substantial increases were derived mainly from two special sampling projects undertaken by the OWRC. One, an evaluation of the detergent removal efficiency of all OWRC-operated sewage treatment plants required measurement of anionic detergents in all raw and effluent samples. The other requested total phosphorus values in all samples of stream discharges to the Lower Great Lakes in an effort to evaluate contributions from these sources towards algal productivity.

Other special projects during the year included the special preparation of legally acceptable analytical evidence in four cases involving pollution of the Province's surface waters. Of the four analytical projects of this type undertaken during the year, three contributed to the gaining of convictions. Corrective action resulted from the other case. Two of the cases involved OWRC prosecutions.

MONTHLY TEST TOTALS
CHEMICAL LABORATORY
COMPARISON 1963-1964



MONTH	NO. OF TESTS PERFORMED		% INCREASE OR DECREASE
	1963	1964	
JANUARY	7322	7966	+ 9%
FEBRUARY	7134	8646	+ 21%
MARCH	8508	8918	+ 5%
APRIL	7886	9516	+ 21%
MAY	11364	11127	- 2%
JUNE	10491	13705	+ 31%
JULY	12198	14176	+ 16%
AUGUST	12782	17208	+ 35%
SEPTEMBER	12421	17315	+ 39%
OCTOBER	10019	13129	+ 31%
NOVEMBER	10590	12801	+ 21%
DECEMBER	7285	10672	+ 46%
TOTAL	118000	145179	+ 23%

Substantial numbers of samples were derived from preliminary studies of water quality at three proposed water intakes; the proposed pipeline intake from Lake Huron, the harbor at Owen Sound, and a proposed alternate municipal intake at Bracebridge. The analytical results were instrumental in planning intake locations to the best advantage so as to obtain the best quality of raw water available. Projects of these types are expected to continue and expand in subsequent years.

Projects undertaken by the Chemistry Branch in response to internal suggestions towards progress included evaluations of three instruments preparatory to subsequent selection for purchase. In the Water Section, automatic titrimeters were tested; the Organic Section evaluated double-beam recording spectrophotometers, and all sections were interested in evaluations of a device to provide automatic sample transfer through our present routine spectrophotometers. The Industrial Wastes Section utilized one man for six months in calibrating and evaluating an electronic polarograph transferred from the Purification Processes Branch.

INDUSTRIAL WASTES BRANCH

The Industrial Wastes Branch of the Division of Laboratories is responsible for the investigation, control and regulation of industrial wastes discharges in the Province. During 1964, the Branch complement was 14, consisting of one supervisor, two assistant supervisors, six field engineers and four engineers' assistants. One engineering position remained unfilled at the year-end. Field engineers and assistants were assigned to four Engineering Districts for routine survey and investigational duties. Special projects, requiring technical experience for the detailed study of waste disposal in specific types of industry, were assigned to individuals or groups for study throughout the Province.

Summary of Field Activities

Field activities continued to expand in 1964 as industrial expansion continued throughout the Province and the importance of pollution from industrial sources received widespread public attention. Investigations were made at 421 industries, ranging from extensive, detailed studies at the larger basic process industries to routine field reviews of a large number of relatively small industries. The following table indicates the scope of the work:

	<u>Districts</u>				
	1	2	3	4	Total
Total Field Visits	116	101	90	100	407
Industry Surveys	40	84	60	52	236
Municipal Surveys	2	1	3	1	7
County Surveys	1	1	1	1	4
Reports Issued	31	23	53	24	131
Proposals Received and Reviewed	10	5	10	8	33
Proposals Accepted	7	3	10	8	28
Meetings with Industries and/or Municipalities	16	18	30	25	89
Number of industries reported in municipal surveys					- 76
Number of industries reported in county surveys					- 109

Status of Industrial Waste Control

The continuing large-scale industrial growth in Ontario, impressive in all types of industry but most noteworthy in the chemical industry, continued to out-strip the capabilities of the branch to provide complete field coverage. In addition to the establishment of new industries, continuing change in processes and production in existing plants gave rise to increasing water-use and the continuing introduction of new waste components for which treatment and controls were not always readily available. In addition to the 421 industries visited in the field, some 500 others were kept under active consideration at the branch offices by review of previously obtained data. The evaluation of suitability of wastes from these for discharge to surface waters, municipal sewers, or to land disposal is given in the following summary:

<u>Districts -</u>	1	2	3	4	Total
<u>To Surface Waters:</u>					
Satisfactory	54	60	21	31	166
Unsatisfactory	99	101	38	73	311
Total	153	161	59	104	477
<u>To Municipal Facilities:</u>					
Satisfactory	53	74	19	26	172
Unsatisfactory	6	17	41	26	90
Total	59	91	60	52	260

Districts -	1	2	3	4	Total
<u>Land Disposal:</u>					
Satisfactory	5	8	1	2	16
Unsatisfactory	2	--	4	7	13
Total	7	8	5	9	29
<u>Status Unknown or Uncertain:</u>	40	40	21	11	112
Total (Satisfactory) -	354				
Total (Unsatisfactory) -	414				

It would be difficult to conclude from a summary presentation the degree of progress being made from year to year. Many industries which were reported had relatively minor waste loadings compared with large integrated basic industries such as pulp and paper mills, steel mills, oil refineries, chemical process industries, mines and mills, smelters, and refineries. The characteristics of wastes varied from one type of industry to another, so that each type would have to be evaluated on its own merits.

Notable installations of industrial waste treatment or control facilities completed or proposed during the year include:

Completed

<u>Name</u>	<u>Location</u>	<u>Type of Treatment</u>	<u>Approx. Cost</u>
The Canadian Motor Lamp Company, Ltd.	Township of Foley (Parry Sound)	Complete plating waste treatment	\$60,000
Hercules Powder Co. Ltd.	Burlington	Oil separator	50,000
Canada Ferro Co. Ltd.	Brampton	Cyanide treatment	8,000
John B. Stetson Co. Ltd.	Brockville	Mechanical screen	---
Aluminum Co. of Canada Limited	Kingston	Oil collector	---
Du Pont of Canada Ltd.	Kingston	(a) Separation of phenolic wastes for land disposal. (b) Oil trap and collector.	---

<u>Completed</u>		<u>Type of Treatment</u>	<u>Approx. Cost</u>
<u>Name</u>	<u>Location</u>		
Canadian Locomotive Company, Ltd.	Kingston	Diversion to municipal sanitary sewers.	---
Canadian Industries Ltd.	Cornwall	Control of carbon tetrachloride and solids losses.	---
Canadian International Paper Co., Ltd.	Hawkesbury	Rehabilitation of waste lagoons.	---
Algoma Steel Corp. Ltd.	Sault Ste. Marie	Segregation of sanitary wastes for discharge to municipal sewers.	\$1,200,000
Robson-Lang Leather Co., Limited	Oshawa	Revisions to primary treatment.	---
Joseph E. Seagram and Sons, and Carling Breweries, Limited	Waterloo	Control of waste discharge to municipal sewers.	---
Northern Pigment Co., Ltd.	Etobicoke	Diversion of wastes to municipal sanitary sewers.	---
<u>Proposed</u>			
Dominion Foundries and Steel Co., Ltd.	Hamilton	Coke oven, blast furnace, and steel mill waste treatment and control.	\$3,250,000 (est.)
Great Lakes Paper Co., Ltd.	Fort William	Primary treatment for proposed Kraft mill.	\$1,500,000. (est.)
De Havilland Aircraft Company, Ltd.	Malton	Chromium treatment	\$ 210,000.
Imperial Oil Enterprises Ltd.	Sarnia	Deep well disposal of cyanide wastes.	---
Uranium Mines	Elliot Lake	Diversion of surface waters - treatment of mill wastes - capping of tailings ponds.	---

Proposed

<u>Name</u>	<u>Location</u>	<u>Type of Treatment</u>	<u>Approx. Cost</u>
Canadian Johns-Manville Co., Limited	North Bay	Primary treatment and lagooning of pulp mill effluent.	\$90,000 (est.)

Control of Wastes to Municipal Sewers

The investigation of wastes being discharged to municipal sewerage facilities continued to receive attention as the number of municipal treatment plants in operation increased. Many of the 261 industries in question were examined a number of times as recurring problems were reported. Emphasis was given to the need for the establishment and enforcement of municipal sewer-use ordinances as the basis for control, and it was significant to note that many municipalities had improved sewer-use control by this means. Efforts to bring about a uniform control based on the recommendations of the Commission led to the widespread adoption of a standard schedule of quality controls for the acceptance of industrial wastes in municipalities throughout the Province.

Comprehensive industrial waste surveys were carried out at Barrie, Cornwall, Markham, Orillia, St. Thomas, and Streetsville, in which the total industrial water-use and waste discharge loadings to the municipal sewers were evaluated.

The Pulp and Paper Industry

Surveys carried out at 23 pulp and paper mills in Ontario indicated that the industry as a whole continued to be a major source of stream pollution. While significant progress was made in minimizing wastes at the source, the need for extensive revision of production methods and equipment was apparent as the basis for the pre-control which appeared to be necessary to bring waste treatment within practicable reach of many companies. Consultations with senior management personnel at 13 of the mills surveyed were held with the Chairman and Vice-Chairman and other members of the Commission in which the pressing need for a greatly expanded pollution control program in the industry was stressed.

Radioactive Pollution from Uranium Mining Wastes

Widespread public attention was drawn to the low-level radioactive contamination of surface waters which resulted from the mining and milling of uranium-bearing ores in the Bancroft and Elliot



Lake areas. Studies carried out since these mining areas were first developed in the mid and late 1950s, limited for a number of years to conventional measurements of waste quality, were intensified as recently acquired means for evaluating radio-activity from soluble radium in water became available in Provincial laboratories. Large-scale rehabilitation of waste disposal sites in use for a number of years, many of them serving mines which had become inoperative, and the treatment of waste waters from existing operations were reviewed with representatives of the mining industry and corrective action begun. An exhaustive study of all aspects of the problem was undertaken by an interdepartmental committee of deputy ministers on which the Commission was represented.

Hamilton Bay-front Industries

Extensive surveys of the major industries located in the bay-front area of Hamilton were completed and reported to industrial management and the municipality. The response from industry, in setting out waste control and treatment programs, indicated elimination of most of the major waste components would be effected in a staged program during the next several years. Action by the municipality to have wastes which could

be treated in the new municipal treatment plant diverted to the municipal facilities was eliminating some direct discharges to the bay, as the year ended. Treatment of steel industry wastes at the industrial sites represented a series of undertakings of considerable magnitude requiring continuing review as works were installed or expanded.

General

The great variety of industrial waste treatment and disposal problems to be dealt with made it difficult to set out a uniform approach by the Commission throughout the Province. Included in The Ontario Water Resources Commission Act was legislative authority for control. However, as a guide to setting out a workable procedure, a study of industrial waste control by regulatory bodies in the United States was made during the year in which contacts were made with most of the appropriate State agencies. A draft of a revised system of receiving industrial waste disposal proposals and issuing certificates of approval was prepared on the basis of the information compiled for consideration during 1965.

In addition to the many problems of waste disposal to surface waters and municipal sewerage systems, the branch was faced with an increasing number of proposals for land disposal of both liquid and solid wastes and for the deep-well disposal of liquid wastes. Since the regulatory controls appeared to overlap those of other Provincial agencies, many proposals were dealt with jointly. A means of establishing an improved procedure appeared to be desirable, and it was intended studies in this regard would continue.

PURIFICATION PROCESSES BRANCH

In the 1963 Annual Report, it was pointed out that the engineers of the Purification Processes Branch had been going through a training period and that it had not been possible to use their full potential. A review of the work carried out in 1964 revealed the value of that training in new methods of analysis and new laboratory techniques were being realized in their evaluation of new equipment and processes, in acceptance tests on new plants, in trouble shooting, and technical assistance in the operation of the older plants. Throughout the year, the other OWRC divisions made increasing use of branch help in problems involving chemistry.

Waste Water Treatment

Teeswater Creamery

Wastes at this creamery were treated biologically by means of the extended aeration process. During 1964, the plant experienced sludge bulking problems in its final settlement section. The causes were felt to be poor design of the final clarifier, shock loading of wastes, very high pH of the wastes and inadequate oxygen transfer during the seasonal peak loading. High seasonal loads were handled satisfactorily by reverting to the fill-and-draw process. Continuous operation was satisfactory for normal flows provided the high pH wastes were segregated.

Waterloo Sewage Treatment Plant

The consulting engineer's report on this plant recommended that pressurized-air flotation studies be undertaken to evaluate the feasibility of this process for the concentration of waste activated sludge. Pilot plant studies undertaken by the branch showed that the waste activated sludge could be concentrated from 3,000 to 6,000 ppm suspended solids to five per cent floated solids. The addition of a high molecular polyelectrolyte coagulant chemical was necessary to produce optimum results. The chemical costs were high and found to be dependent on the characteristics of the sludge being floated. It was hoped that overall plant improvement would result in sludge amenable to flotation but with a lower chemical demand. Studies on the floated sludge showed it could be vacuum-filtered readily.

In line with future extensions proposed for this sewage plant, studies were undertaken to evaluate the oxygen transfer characteristics of the present aeration system. The studies showed the present aeration system incapable of meeting the oxygen requirements of the wastes which had an abnormally high oxygen demand due to the presence of industrial wastes. Bench-scale studies were to be undertaken to determine the oxygen requirements of the wastes and the results would serve as a criteria for the future design calculations.

Mechanical Surface Aerators - Acceptance Tests

This branch was active in the carrying out of full-scale acceptance tests for a mechanical surface aerator at the Newmarket-East Gwillimbury Water Pollution Control Plant. The surface aerators were satisfactory in meeting the oxygen transfer requirements but required modifications to meet the efficiency requirements. The tests showed that bottom velocities possibly would be inadequate to maintain sludge in suspension and at the year's end studies had started under actual plant operating conditions to determine whether sludge deposition was occurring in the aeration tanks.

At the request of the consulting engineer, the branch also participated in acceptance tests of mechanical surface aerators at the London Pottersburg Pollution Control Plant and at the London Greenway Pollution Control Centre.

"Alpha" Factor Studies

Laboratory-scale tests were conducted using a model surface aerator for the determination of "alpha" factor of various waters--the degree to which a water containing organic contaminants influences oxygen transfer. Among the waters tested were Newmarket, London and Toronto tapwaters and distilled water. Marked variations were found in the results which indicated that possibly a correction for "alpha" factor should be considered in future studies of aerators. It should be pointed out that each particular aeration device would have to be tested for "alpha" factor, since the mechanisms of oxygen input to the water vary among various aeration devices.

Oxidation Ditch

On a fact-finding trip sponsored by the Division of Research, several oxidation ditch installations in the United States and Canada were inspected to determine whether this method of wastewater treatment might be suitable in Ontario. It was found that the treatment process was similar to an extended aeration process, and that effluent quality was equal to that achieved by the conventional activated sludge process, provided excess sludge was wasted regularly.

Ott Current Meter

Since this instrument had been used extensively to measure bottom velocities in aeration tanks, laboratory experiments were conducted to determine how the meter readings should be interpreted. Data showed that resultant velocities could be calculated from the measured component vectors. A second series of experiments indicated that entrained air bubbles would give erroneous results when the current meter was used to estimate discharge rates in channels or flumes.

Diffused Air Studies

Experiments were conducted in the laboratory to estimate the oxygen transfer efficiency in a diffused air system from the oxygen concentration in the exit gas. A gas partitioner was used to determine the per cent oxygen in the exit gas. Results revealed that the oxygen transfer efficiency could be determined accurately by this method. Whether oxygen analysis of the exit gas could be used as a reliable field method would depend on the satisfactory design of a portable, airtight hood to cover a section of a diffused air tank.

Alliston

The Industrial Wastes Branch was assisted in its extensive evaluation of the aerated lagoon waste treatment system of a potato processing plant at Alliston. Results generally indicated an anaerobic process produced the observed BOD removal. An attempt was made to relate the BOD of a sample from the aerated lagoon to the measured oxygen uptake rate. No correlation was found, probably due to the absence of dissolved oxygen.

Georgetown

The detailed process evaluation of the sewage treatment plant, carried out in 1963, was followed by a brief inspection for the purpose of updating the previous observations. Several dissolved oxygen surveys were conducted in addition to determining the variation of the oxygen uptake rate of the mixed liquor through the aeration system. Plant operating records were also analyzed.

Elora

A series of tapwater aeration tests was conducted on the coarse bubble aeration system of the newly constructed sewage treatment plant, to determine the aeration capacity and the oxygen transfer efficiency. Test results showed lower efficiencies than could be expected from available literature. Repeat-tests were to be carried out in the spring of 1965 to confirm these results, with the consulting engineer and equipment supplier in attendance.

London

Gas analyses were made of the gas accumulating in the sludge storage tanks at the Greenway Water Pollution Control Centre to determine if there was any danger of an explosion from this gas.

Port Credit

The Texaco Oil Refinery asked for technical assistance when its phenol oxidation plant stopped functioning properly.

Court Cases

This branch co-operated with the legal branch in two court cases in eastern Ontario.

Water Treatment

Taste and Odor

During the year, one of the most urgent problems was the occurrence of adverse tastes and odors in municipal water supplies. Immediate investigations following the complaints revealed most

of these conditions were attributable to the appearance of certain taste and odor-causing algae in the water. One condition, perhaps the most troublesome in memory, occurred in the Belleville water supply. The troubles began in January and prevailed through the entire year. At the request of the city officials, an extensive program of experimental work was conducted by the branch for the purpose of finding a practicable solution which could be implemented with the present facilities.

Water supplies in other communities such as Campbellford, Dunnville, Espanola, Minden, Perth and Wellington were reported to be affected by adverse taste and odor conditions. However, the conditions were not as severe as those in Belleville and in most instances they could be corrected, at least temporarily, either by application of modified chlorination or by a regular program of flushing the mains.

The Ford Motor Co. at Welland asked for help with a taste problem in the plant water supply. It was found that the finished water was quite aggressive and the taste was due to iron picked up in the distribution system. Better technical control of the company's water treatment was recommended.

Technical Assistance

Whenever a new water treatment plant was put into operation, technical guidance involving laboratory tests, calibration of equipment, and application of chemicals was provided to the operator, if requested. Assistance of this nature was given to operators at Campbellford, Eganville and Perth.

The Town of Picton was given help in solving a problem concerning alum floc getting into its distribution system.

Stability tests were made on a new test well for the Town of Midland.

Special Assignments

Background material was prepared for an OWRC survey report, the "Water Pollution Survey, Town of Acton," and also "Water Purification Studies in Ontario," a paper which was presented at the 84th Annual Conference of the A.W.W.A.

A special study was made of the devices for chlorine residual determinations.

A laboratory study was made in co-operation with the Bacteriological Branch to investigate the disinfectant properties of potassium permanganate.

Other Assignments

At the request of other OWRC divisions and governmental departments, special investigations were carried out as follows:

- (1) Water quality survey at Hagersville.
- (2) Corrosion problems in
 - i) Chatham
 - ii) Beaverton
 - iii) Forest.

(3) Pilot studies with a diatomite filter at Ontario Fire College, Gravenhurst, at the request of the Ontario Department of Health.

Potassium Permanganate

A number of inquiries were received from Ontario municipalities with regard to using potassium permanganate in treating water supplies. This chemical appeared to have real value in controlling taste and odor and also as a coagulant aid. It had not been an answer to all taste and odor problems and could introduce staining problems and false chlorine tests. This chemical should be used only where a proper method of feeding and good technical control are available.

Laboratory

Dissolved Oxygen Meters

Due to the interest of a number of the divisions of the Commission in devices for measuring dissolved oxygen, the branch attempted to obtain information on all new instruments on this type which have come on the market. Where possible, the instruments were brought into the laboratory and tested, while in some cases, it was necessary to depend on the experience of other laboratories.

The dropping mercury electrode type of meter was quite accurate with a reasonable response time. It was limited to certain kinds of samples and was better for laboratory work than for field work.

The membrane type of electrode would appear to be ideal for field work but none was found which had a satisfactory response time and the accuracy required for the work. They would be useful for monitoring where the changes in dissolved oxygen were slow.

The thallium type of electrode would appear to be more applicable to boiler waters where a very low concentration of oxygen was being measured.

Despite the statements made by the manufacturers to the contrary, the feeling in the laboratory was that these instruments required trained technicians to operate and maintain, and more development work done on them before they were turned over to sewage plant operators.

Laboratory Instruction

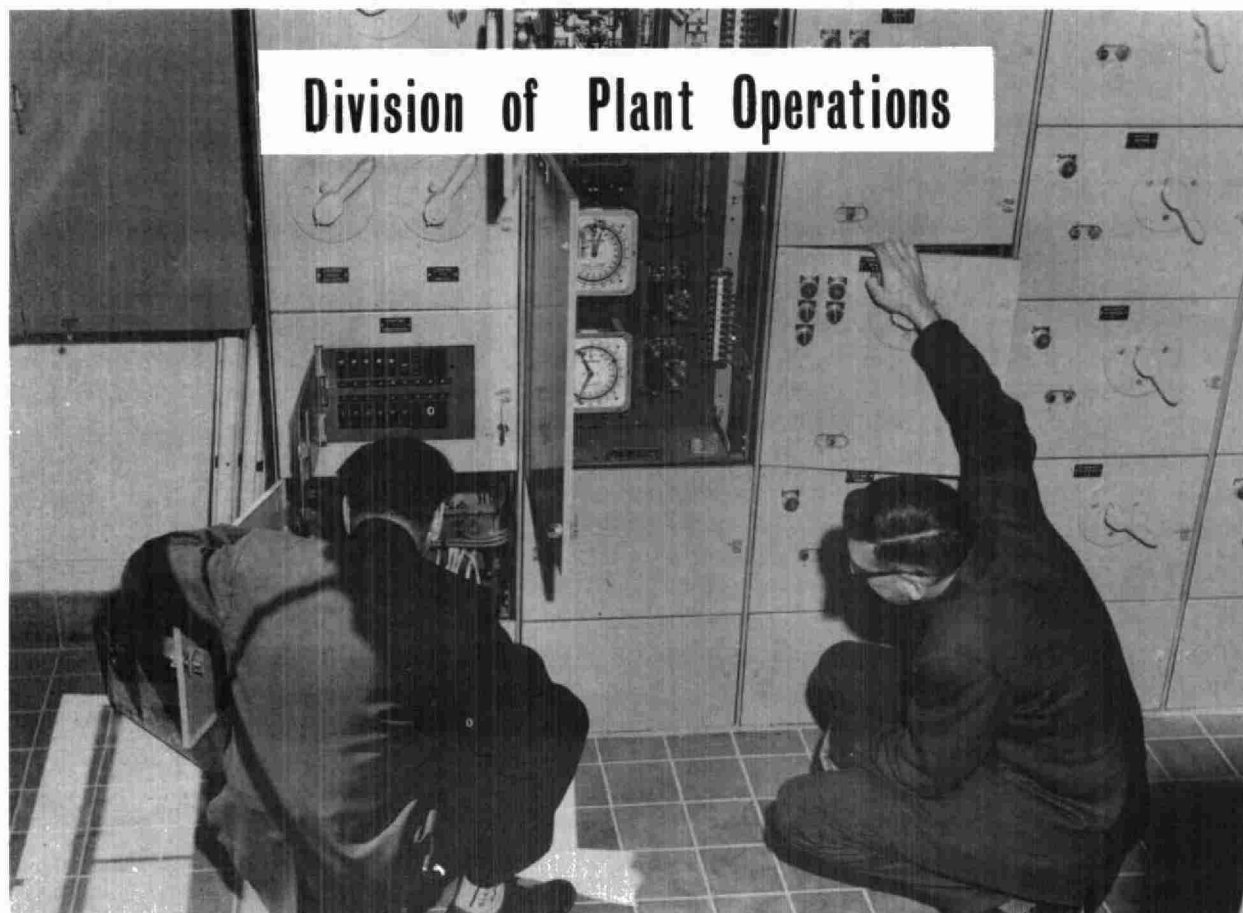
Frequent requests were received for technicians to go to water works and sewage treatment plants to instruct operators in chemical analyses.

Analytical Work

Number of samples received in the laboratory	706
Number of determinations made in the laboratory	7,744
Number of determinations made in the field	<u>5,312</u>
Total number of determinations made	- <u>11,556</u>

There was an increase in the number of samples received in this laboratory for special analyses and also an increase in the number of determinations made. The number of determinations made in the field showed a decided drop in 1964 due to the transfer of all research work to the Division of Research.





Division of Plant Operations

B. C. Palmer, Director
C. W. Perry, Assistant Director

Activities of the Division of Plant Operations continued to be highlighted by a rapid growth rate. A 24 per cent increase through 1964 in the capital value of projects in operation was handled without any major change in the division organization structure.

Earlier difficulties of recruiting experienced water and pollution control plant superintendents have, over the past two years, eased. There is now an adequate reservoir of experienced plant operators from which to select supervisory staff for new projects.

The policy of maintaining contact with municipal officials through division staff attendance at Local Advisory Committee or regular council meetings continued. These meetings provided a good channel of communication and liaison between municipal officials and OWRC staff.

The division safety program was given added emphasis through the consolidation of safety instruction and training responsibilities under a safety and training officer.

Statistical Summary

Statistics, indicative of the division program, follow--

- (a) Total capital cost of works in operation as of December 31, 1964--

Sewage Projects	\$76,081,834	
Water Projects	<u>\$23,654,928</u>	
TOTAL		\$99,736,762

Capital value of works which came into operation in 1964--

Sewage Projects	\$17,328,834	
Water Projects	<u>\$ 1,753,928</u>	
TOTAL		\$19,082,762

- (b) Projects in Operation

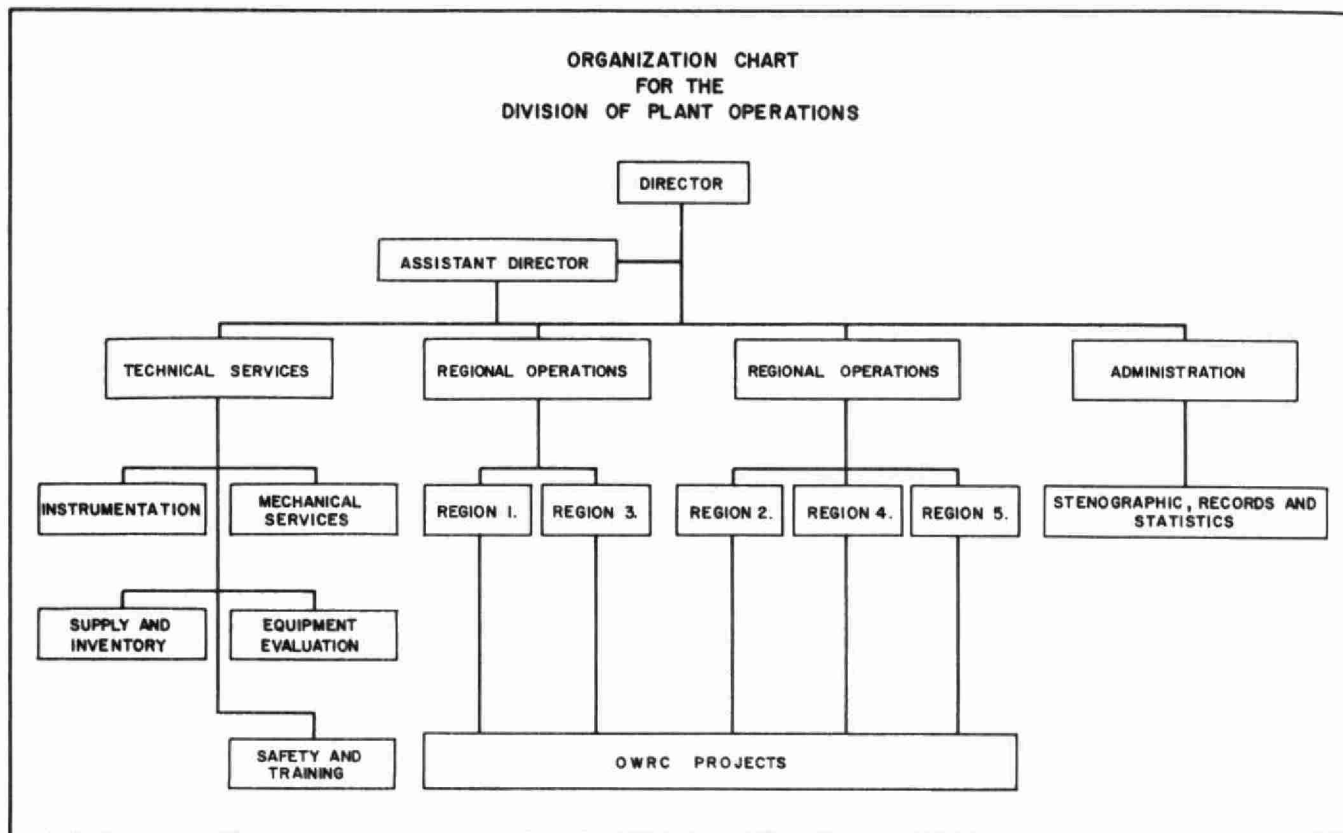
<u>Year</u>	<u>Water</u>	<u>Sewage</u>	<u>Total</u>	<u>Increase</u>
1958	9	6	15	
1959	21	13	34	19
1960	32	33	65	31
1961	53	58	111	46
1962	74	81	155	44
1963	85	106	191	36
1964	96	134	230	39

- (c) Total Operating Costs of Projects--

Water	\$ 440,962
Sewage	<u>\$1,936,349</u>
TOTAL	<u>\$2,377,311</u>

- (d) Total Operators on OWRC Payroll--

1958	15
1959	22
1960	92



STAFF COMPLEMENT

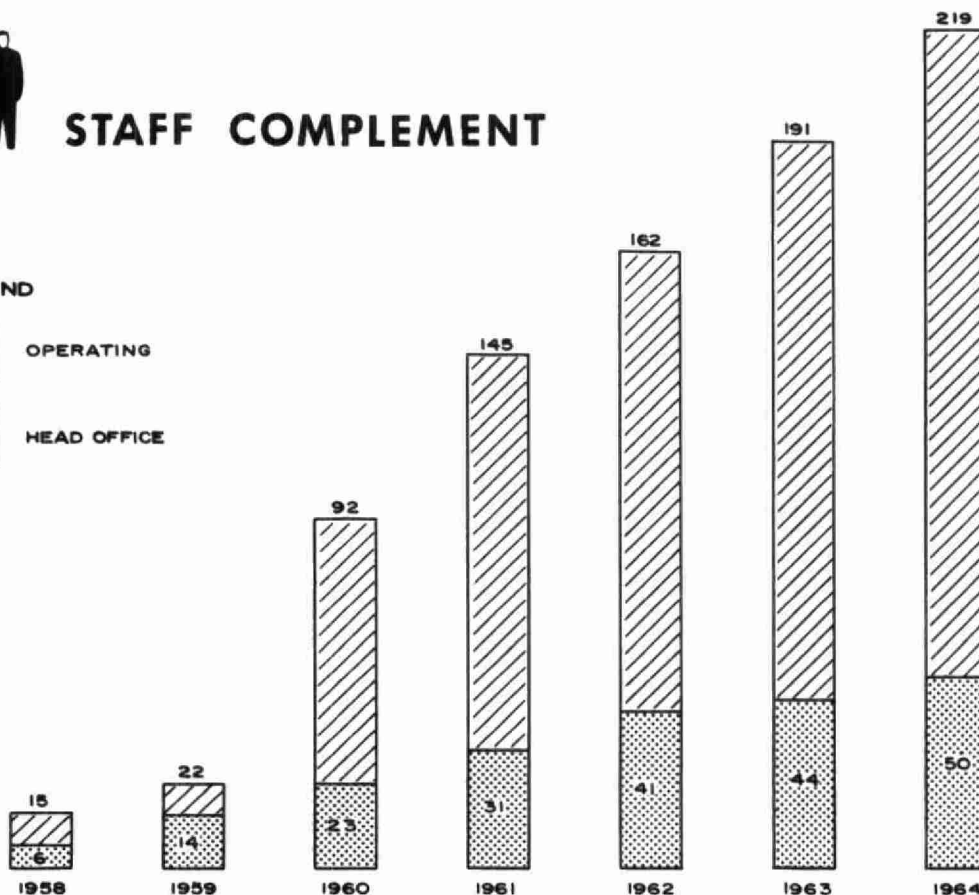
LEGEND

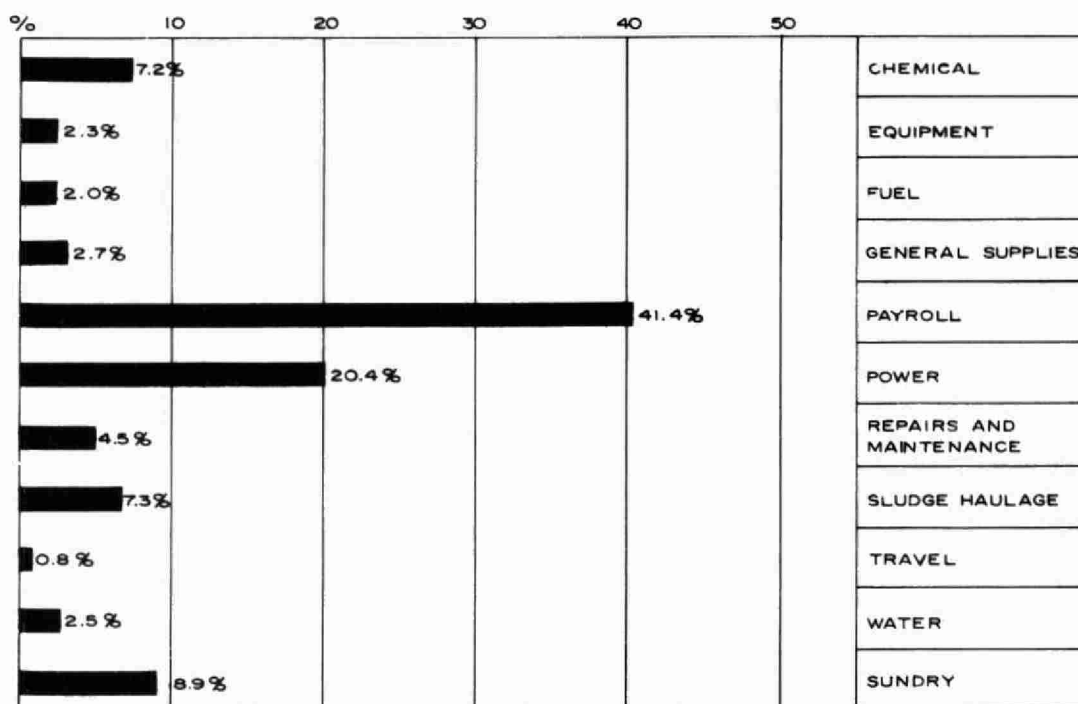


OPERATING

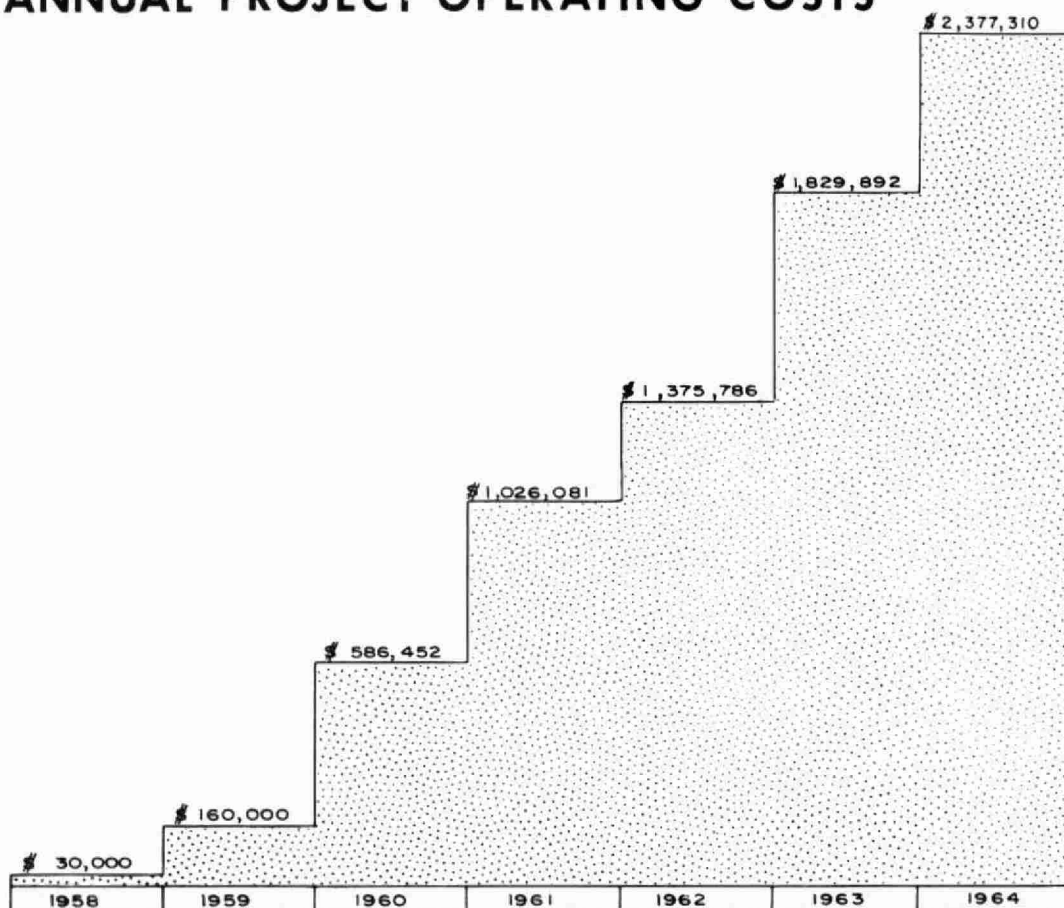


HEAD OFFICE





ANNUAL PROJECT OPERATING COSTS



1961	145
1962	162
1963	191
1964	210

(Water systems operators - 37; Sewage plant operators - 173)
Eleven of these were part-time operators

(e) Total volume of sewage treated in 1964 - 49,392.312 mg
Average cost of mg of sewage treated \$ 65.88
Average cost of tg of water treated \$ 0.063

Projects which came into Operation in 1964

Water Projects

63-W-81 Anson, Hindon & Minden	63-W-118 Twp. of Whitchurch
63-W-107 Twp. of Louth	63-W-119 Sault Ste. Marie
63-W-108 Harrow	63-W-120 Newcastle
63-W-109 Frankford	63-W-125 Twp. of Thorah
63-W-111 Belle River	63-W-128 Twp. of Saltfleet
63-W-115 Geraldton	

Sewage Projects

60-S-59 Fort Frances	62-S-125 Elora
61-S-80 Smithville	62-S-132 Alexandria
61-S-87 Newmarket and Twp. of East Gwillimbury	62-S-134 Twp. of Tarentorus
61-S-88 Twp. of Moore (Corunna)	62-S-137 Powassan
61-S-91 Fort William	62-S-138 Twp. of Toronto
61-S-93 Exeter	62-S-140 Frankford
62-S-102 Chatham	63-S-145 Twp. of Toronto
62-S-108 Port Colborne	63-S-146 Midland
62-S-112 Mattawa	63-S-147 Thorold
62-S-115 Port Dover	63-S-151 Midland
62-S-116 New Liskeard	63-S-155 Twp. of Ernestown
62-S-119 Waterford	63-S-156 Port Arthur
62-S-122 Sutton	63-S-157 Little Current
62-S-124 Lindsay	63-S-159 Burlington

The 230 projects in operation served a total of 157 municipalities and five industries and could be broken down to show the following operating facilities:

Sewage Facilities

Primary Treatment Plants	- 15
Secondary Treatment Plants	- 25
Lagoons	- 31
Sewers and Pumping Stations	- 57
Total Oxidation	- 5
Trickling Filter	- 1

Water Facilities

Treatment Plants	- 20
Wells	- 23
Standpipes	- 7
Lake Intakes	- 7
Reservoirs	- 6
Mains Only	- 33

Projects which came into operation during 1964 break down as follows:

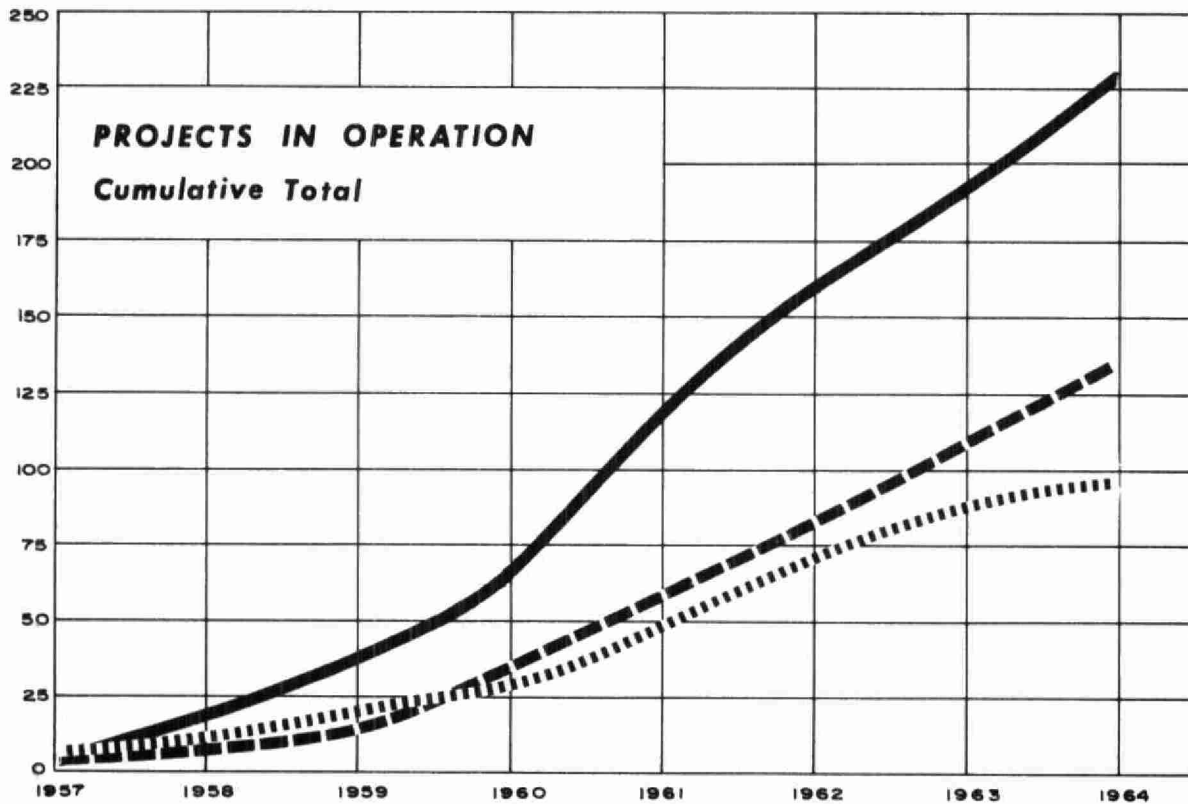
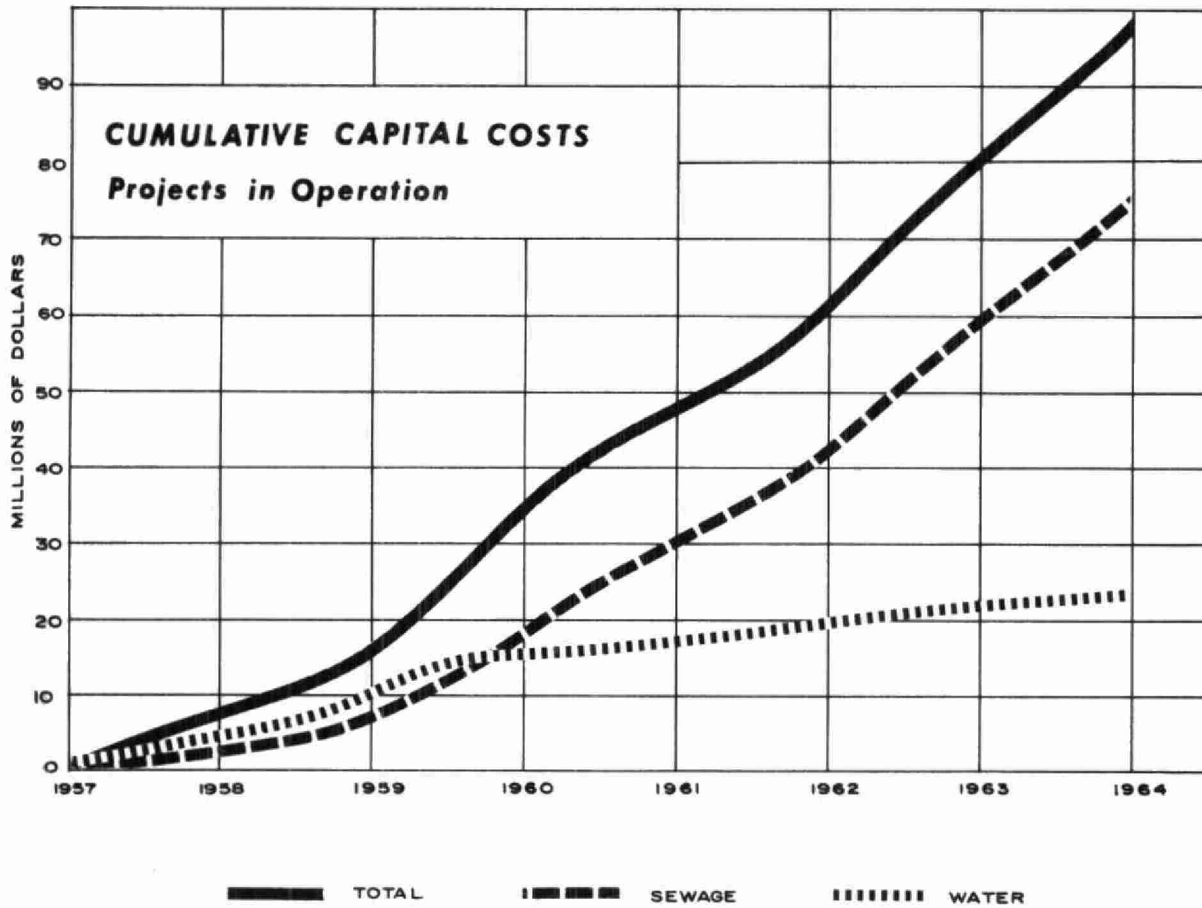
Sewage Facilities

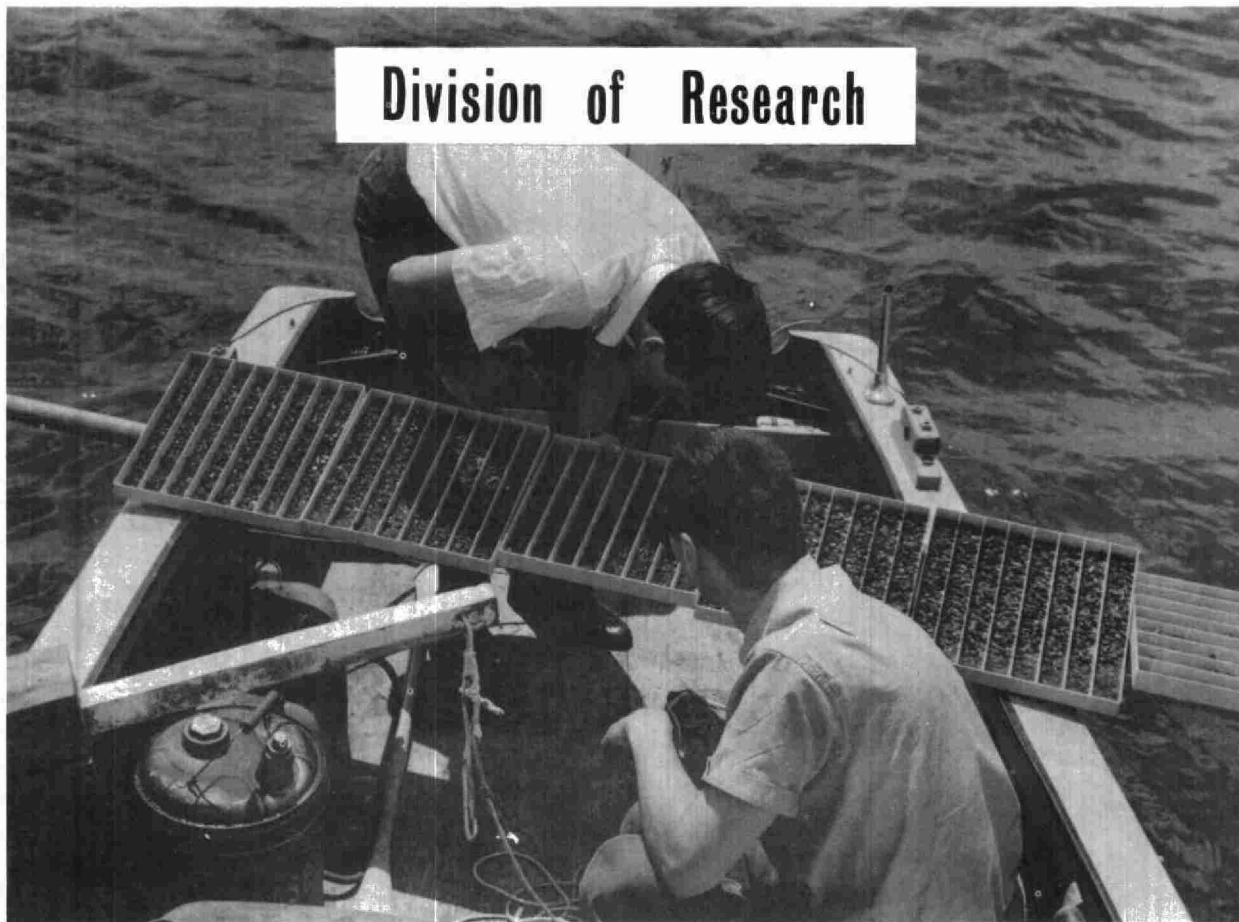
Primary Treatment Plants	- 3
Secondary Treatment Plants	- 2
Lagoons	- 11
Sewers and Pumping Stations	- 10
Total Oxidation	- 2

Water Facilities

Wells	- 1
Standpipes	- 1
Reservoirs	- 1
Mains	- 7
Extension to Filter	- 1







Division of Research

A. J. Harris, Director

Activities within the Division of Research during 1964 reached a relatively high peak of endeavour through a number of co-operating efforts both inside and outside the Commission. Significant interdivisional projects such as the waste stabilization pond study, the oxidation ditch field survey, and the sludge lagooning trials at Lakeview were initiated. The Biology Branch of the Division of Laboratories continued to supervise the algae control program. Co-operation with industry was also a feature with the running of screening tests for the standardization of fibre sampling procedure.

The division proceeded with a number of other projects, resulting in an overall total of 11 major items. Some were initiated as was the Brampton tertiary pilot plant, and some were completed as was the study on the treatment of cannery wastes by aerated lagoons. At least six reports were submitted to the Commission within the year. Three papers were prepared and presented at meetings of various technical societies.

Two engineers, one research biologist, and one engineer's assistant were added to staff and some laboratory space was assigned for research applications.

More than 500 special analytical determinations were carried out by research personnel, more than 600 routine samples were submitted to the Chemistry Branch of the Division of Laboratories for chemical analyses, 450 samples were submitted for bacteriological analyses, and 80 algae count samples were processed by the Biology Branch. Research staff was assigned to complete much of the work load which the algal samples represented.

The assignments of the division covered a wide range of activities to obtain useful results. The study of oxidation ditches required an engineer to visit British Columbia and northwestern United States to obtain pertinent data. A considerable amount of travel and attendance for research planning sessions was also required in such programs as algae control, fibre sampling standardization, and the aerated lagoon study. Participation in fish taste trials was also accepted.

In keeping with the policy of undertaking problems of practical or economic importance, considerable attention and literature searching was applied to a number of topics which did not advance into fully active projects. Topics such as phosphate removal from industrial wastes, land surface disposal of liquid wastes, an automatic water quality data collection system, and dissolved air floatation of colloidal organic wastes were not promoted into physical programs for various reasons. The information revealed by preliminary examinations often proved to be valuable in determining which programs might offer the most promise. Projects such as lagoon degradation studies, sludge lagooning, and erosion control at waste stabilization ponds began in 1964 following such investigations.

The main projects of the division summarize as follows--

Algae Control Program

(a) Evaluation of Algicidal Chemicals

Chemical treatment of algae growth beds were made using boat and airplane methods of application. Early applications during June in the Crystal Beach area of Lake Erie produced good results following use of three different algicides at various concentrations. With increased growths developing in Lake Ontario later in the summer, chemical applications also were made in the Burlington area.

At the laboratory, other algicidal chemical samples were solicited and received for preliminary testing. A preliminary screening of some 21 new chemicals resulted in the selection of five promising materials for further testing. Laboratory evaluation included direct application of fresh Cladophora to jar samples for an indication of the efficiency. Bioassays to determine the pertinent fish toxicities also were included.

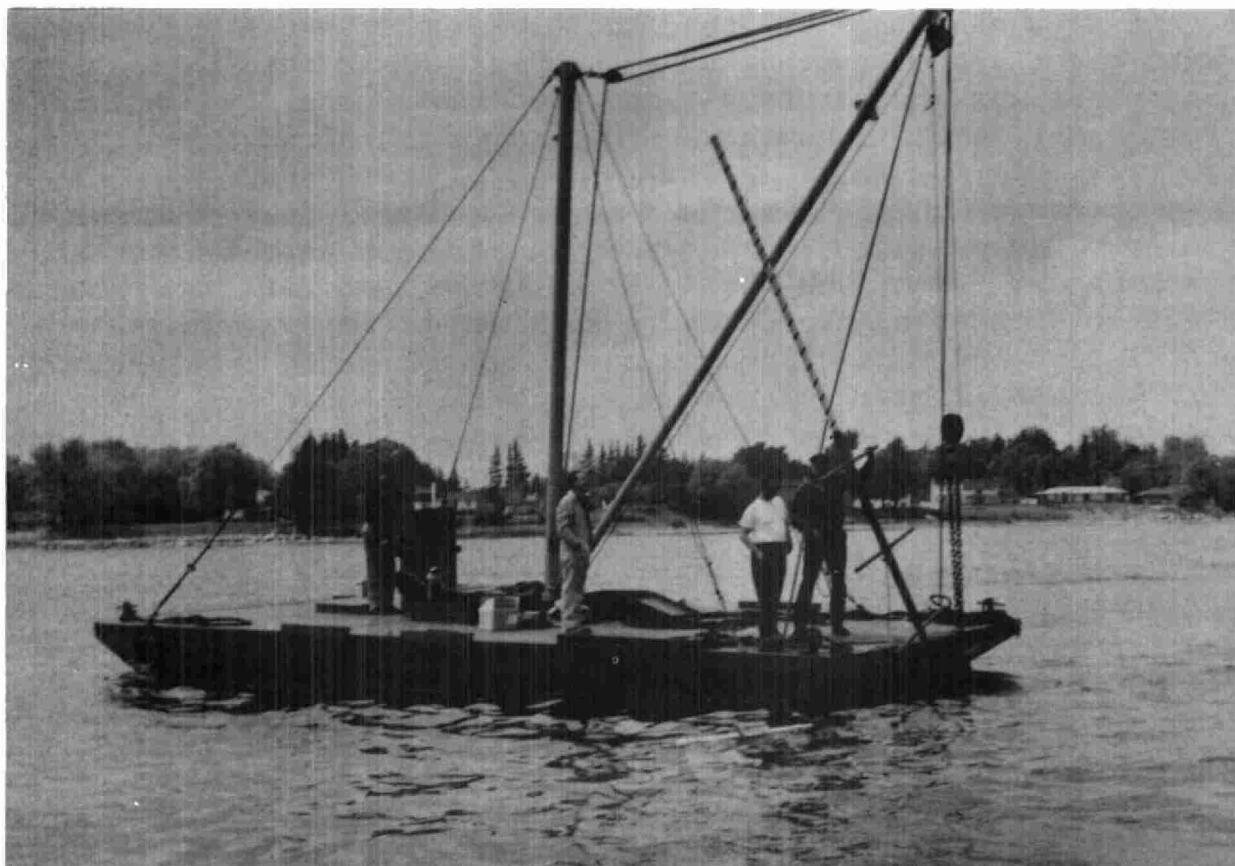
(b) Mechanical Removal

Methods of mechanical removal for shoreline deposits of algae were investigated. Test runs of equipment began in July at Silver Bay on Lake Erie. A portable high-pressure, six-inch pump was employed in a vacuum cleaner fashion to pick up thick water-edge suspensions of algae for ultimate disposal. The pump discharge was variously handled by coarse screening in fenced-in areas by draining and carting off in dump trucks, and by pulverizing the algal content for pipe-line dispersal at some distance from shore. A yolk rake was employed to gather up deposits stranded on the shores.

The equipment also was used at Presqu'ile. In September another piece of beach-cleaning equipment was demonstrated by an industrial firm at the Presqu'ile Provincial Park. Algae separation and removal was included in this piece of equipment's sand-sifting operations.

(c) Surveillance of Growths

Surveillance techniques for observing and measuring algal growth factors were considerably expanded and improved. Aerial photography which, when combined with detailed spot surveys by boat and scuba-diving equipment, gave useful growth estimates. The greatest surveillance was required at Crystal Beach and Port Colborne areas of Lake Erie and the shores of Lake Ontario from Hamilton through to Presqu'ile. Close attention was required to make short-term and long-term evaluations of the chemically treated algal beds.



To obtain better quantitative measurements of algal growth, two underwater towers were erected in the Oakville area of Lake Ontario to support a number of pebble-embedded trays for the cultivation of algal growths at various depths and light intensities.

(d) Additional Study Measures

Additional survey techniques included arrangements with water works located along the Lake Ontario shoreline to submit information on water turbidity and algae growths at regular intervals. Also, in an attempt to evaluate the various types of land sources of phosphate nutrient, sampling surveys were begun in the Metropolitan Toronto area to relate land use to phosphate discharges. Regular sampling of local sewage treatment plant effluents in the Toronto area was arranged on a year-round basis.

Co-operative River Basin Research

A study into the effect of cover vegetation on ground water was being organized during the year as a co-operative

venture with other agencies and the Division of Water Resources. One of the questions which had never been answered in an Ontario environment was whether forest and brushlands actually conserved ground water level in comparison with open grasslands.

In connection with proposed investigations, field surveys of a number of representative watershed areas such as the Ganaraska River, Graham Creek, and Morish Creek, were made for the eventual selection of test areas. Factors such as stream run off measurement, extent and type of ground cover, ground water observation wells, and artificial features which could affect results were considered.

Co-ordination of Waste Stabilization Pond Study

With co-operation from other divisions of the Commission, personnel in the Division of Research co-ordinated a detailed study of existing waste stabilization ponds in Ontario. Information contributed by the divisions of Plant Operations, Laboratories, and Sanitary Engineering were compiled into a summary report on this increasingly popular method for municipal sewage treatment. The report examined construction details, costs, and observation of the treatment process in terms of operation and process efficiency.

The report was able to make a number of useful observations for guiding the design of future installations. Generally, waste stabilization ponds proved to be an effective means of treating sewage realizing BOD, suspended solids, and coliform organism removals of 90, 80, and 99.5%, respectively. Maintenance difficulties with respect to erosion and weed growths were detailed and recommendations made. No change in design loadings was indicated, but the increased use of flow measuring devices was recommended for improved evaluations of performance in future investigations.

A critical review of the report was held at an inter-divisional meeting in September. The report was recommended for a wider distribution and was submitted for further revision and incorporation of illustrative material for final disposition.

Erosion Control Study

A special study of erosion control devices at municipal waste stabilization ponds was initiated in early November. The research on this topic began at a time when a few of the larger, relatively recent, pond installations (over 10 acres per cell) were beginning to show symptoms of erosion damage due to wave action.

As the ponds serving the Town of Lindsay were very large in size, and showing need of erosion protection, they were chosen as a study situation. Three types of protection were to be tested.

Lagoon Degradation Studies

Lagoon degradation studies began in December. This project was to include a close examination of the waste treatment processes to track the fate of protozoa, bacteria, and enteroviruses and other pathogenic organisms. The antagonistic or removal organisms of these hazardous life forms were to be sought. The incidence of mosquitos and mosquito larvae with relation to their predators also was to be studied.

Oxidation Ditch Studies

A high level of interest in oxidation ditch technology initiated a field trip to obtain firsthand information from established sites in Western Canada and the United States. The resulting report generally concluded that oxidation ditches were relatively inexpensive to construct, used simple operation, discharged a consistently acceptable effluent, and merited further consideration as a competitive treatment system for municipal wastes.

A small oxidation ditch rotor was constructed for pilot plant testing.

Sludge Lagooning

Research in the potentialities of sludge lagooning was begun in September with the construction of three sludge lagoons at the Lakeview Water Pollution Control Plant site. Decision to embark on the field study was initiated after a considerable survey had been made regarding alternative measures of sludge disposal. Visits to sludge-handling installations in the Metropolitan Toronto area were made and information was also solicited from the Metropolitan Corporation of Greater Winnipeg.

Direct supervision of the lagoon construction was maintained on the project by research personnel to expedite early completion. Pond sizes included a 75,000 gallon cell 3 feet deep, a 140,000 gallon cell 5 feet deep, and a 594,000 gallon cell 9 feet deep. The main objective of the study was to reduce digested sludge volume to produce a separable supernatant thereby reducing disposal costs of the remaining sludge concentrate.

To compare lagoon treatment procedures in the laboratory, a small eight-foot deep tank with a transparent side wall was con-

structed. Visibility within this latter tank served to help elucidate the phenomena observed at the lagoon site and to allow additional experimentation in the test project.

Results to the year-end had been relatively inconclusive in obtaining a supernatant for return to the treatment plant. However, more encouraging results were obtained with bench scale diffused aeration of sludge surface layers in a combination aerobic-anaerobic treatment. The best results were obtained by simple freezing of sludge samples. A 75% reduction in sludge volume and a clear supernatant was noted in laboratory tests attempting to duplicate the anticipated conditions of the sludge lagoons over the winter months.

Standardization of Pulp Fibre Sampling Procedure

An investigation into the use of a 100-mesh screen cone for the sampling of pulp fibre below paper mills was begun in April with the assistance of the pulp and paper industry. Pulp suspensions were prepared in an agitated indoor tank using four types of pre-analyzed pulp samples obtained from the Ontario Paper Company at Thorold. The pulp suspensions were pumped through the screen cone using a standard technique for four different grades of pulp. The material retained by the screen cone was preserved and returned to the company for re-analysis.

The analytical results of some 70 trial runs were returned from the company for incorporation into a brief report submitted to a technical liaison committee meeting of the OWRC and the Canadian Pulp & Paper Association.

Following a study of this report by the industry, liaison committee meetings were held in October and November to discuss the results and conclusions of the report.

Supplementary Aeration of Lagoons

A detailed cost and feasibility study was made between two alternative methods of lagoon aeration. The use of a surface aerator was compared with diffused aeration systems employing submerged plastic tubing to distribute a wide air bubble pattern. The surface aerator showed a decided cost advantage.

Tertiary Treatment at Brampton

Completion of the tertiary treatment pilot plant construction at Brampton had been achieved by early July. A number of preliminary laboratory tests were performed using the Brampton treatment

plant effluent to anticipate the effects on the proposed tertiary treatment unit. Aeration batch tests were run to determine what further BOD reductions would prove possible. Chemical treatment jar tests using alum, iron salts, and a cationic polyelectrolyte also were tested for possible BOD and suspended solids removal possibilities. Further decisions concerning future control parameters and equipment selection for the study were resolved.

The completed treatment unit consisted of two retention ponds; one, a 15-foot deep, 400,000 gallon basin equipped with aeration devices, and the other, a five-foot deep, one-acre waste stabilization pond. The flow initially was arranged to pass through the ponds in series with the sewage plant effluent entering the aerated pond first. Inspection, composite sampling, flow recording, and numerous analytical tests were set up on a routine daily basis. Treatment evaluation included daily observations. Flow rates were altered through a range involving one to four days aeration and 10 to 40 days retention in the stabilization pond. Periodically, additional test evaluations were undertaken to estimate the efficiency of the aeration devices in the first pond.

Phosphate removal jar tests were begun at the Commission laboratory in preparation for pilot plant testing.

Treatment of Cannery Wastes at Chatham

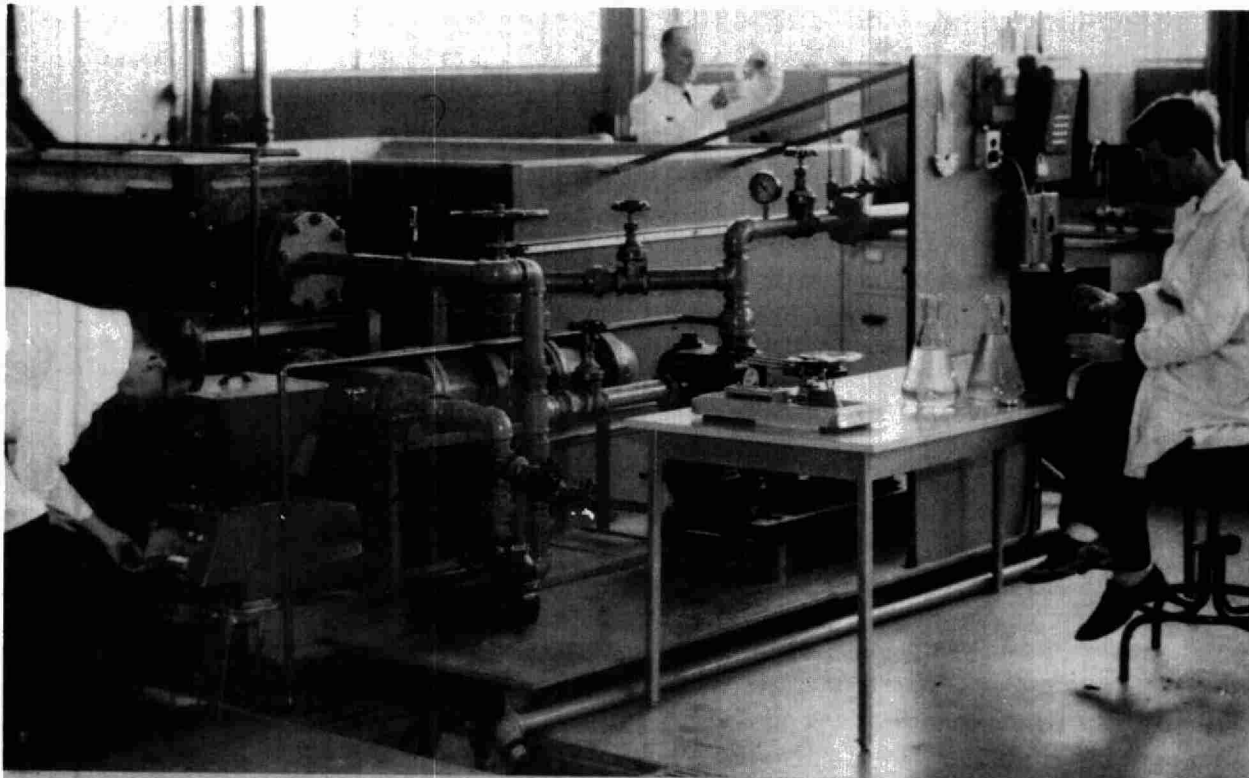
Some additional study went into the investigation of the air hose scaling problem which had developed at the aerated lagoon pilot plant operated on cannery wastes at Chatham during the summer of 1963. While the BOD loading capacities for lagoons aerated by submerged tubing had proved to be at least as high as 350 lb. BOD/acre/day, it was found that aeration by perforated air hose would not be practical unless an efficient method of scale elimination could be devised. The plugging of air slits in the tubing by minute mineral deposits tended to diminish available air supply within a relatively short period.

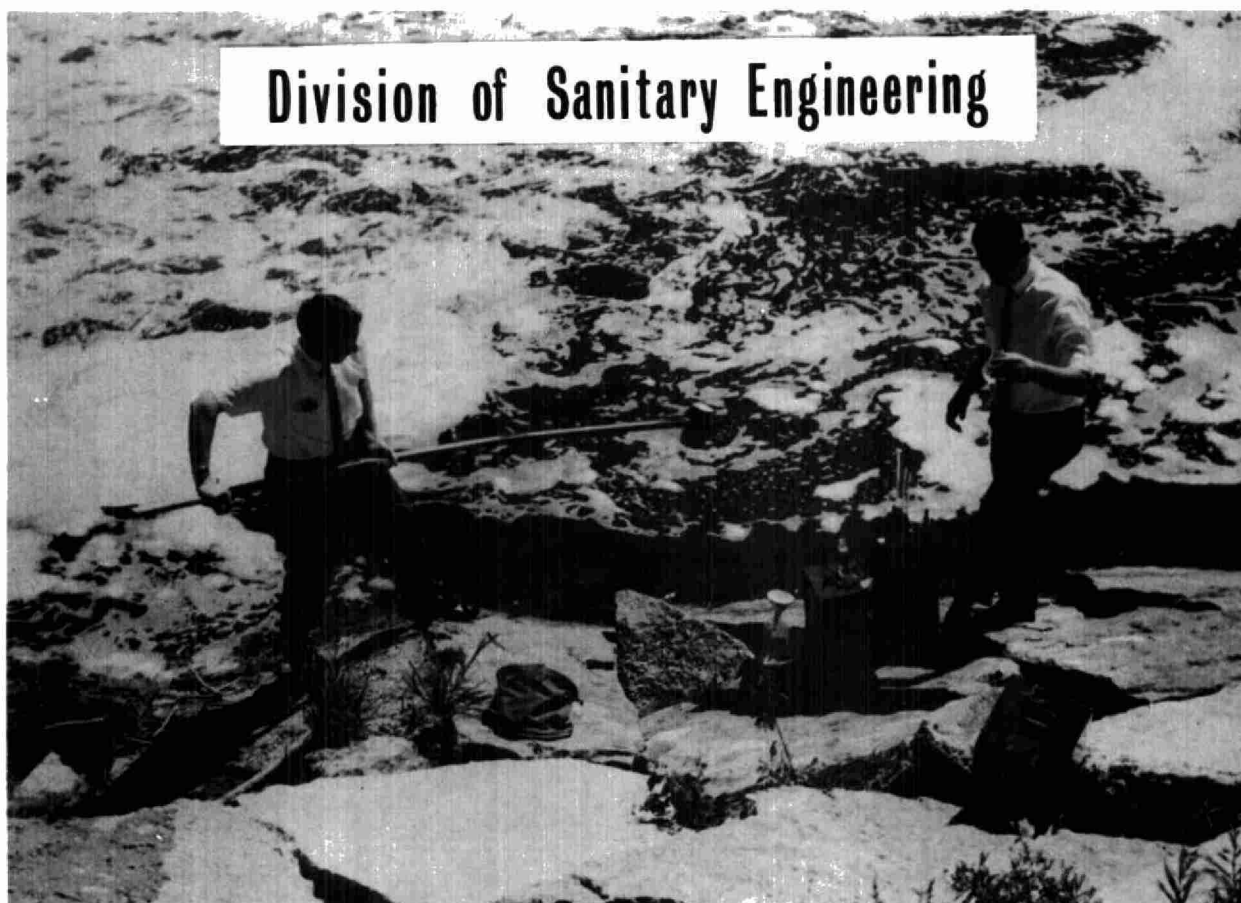
Tests to overcome the problem included the setting up of indoor tanks to duplicate various parameters of the field study.

The injection of atomized muriatic acid into the air supply was found to be an effective measure in the removal of scale deposits. The procedure was tested both in the indoor tank trials and at the Chatham pilot plant, where the air distribution system had been entirely laid out in inert plastic components.

Before the Chatham pilot study was terminated in May, a number of sampling inspections were made to ascertain the wintering characteristics of the ponds.

During the first half of the year, a number of meetings were attended to help establish design criteria for the full-sized lagoons proposed to handle all the wastes from two canneries. Interest in such design criteria appeared to have spread in the canning industry.





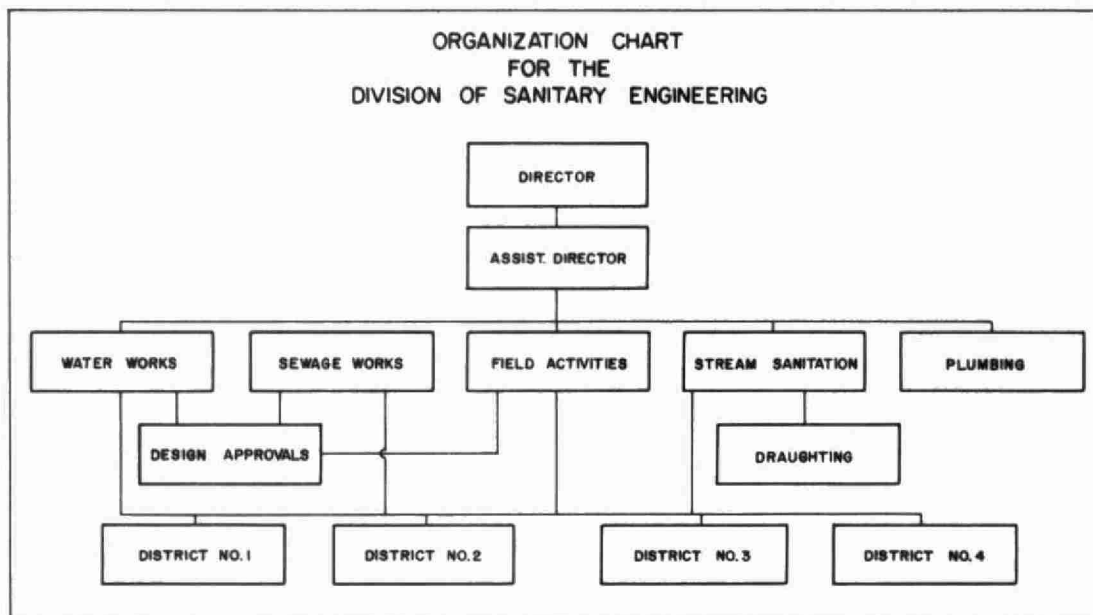
K. H. Sharpe, Director
J. R. Barr, Assistant Director

The programs of the Division of Sanitary Engineering were divided into four main categories: (1) the evaluation of plans of proposed water supply and wastewater treatment installations (2) the inspection and supervision of water and wastewater treatment plants in the province, (3) the study and control of pollution in the waterways of Ontario, and (4) the supervision of plumbing. In 1964, staff participated also in a number of water supply pipeline studies, an addition to the responsibilities and functions of the division. In this work, Sanitary Engineering co-operated not only with other divisions of the Commission but also with the Department of Municipal Affairs (Community Planning Branch) and the Ontario Department of Health (Environmental Sanitation Branch) in the review of subdivisions and inspections in the field of water supply and sewage disposal, both closely allied to the work of the public health authorities.

The various programs were carried out by a staff of pro-

fessional engineers and technical personnel in several branches under the supervision and control of an administrative staff.

There were 29 graduate engineers and 13 engineers' assistants comprising part of a total staff complement of 70.



DISTRICT ENGINEERS BRANCH

Field work continued to be carried out under the supervision of four district engineers each of whom covered designated areas in southern and northern Ontario. In this work, inspections were made in every part of the province. The routine work involved stream and pollution surveys and inspections of industrial waste disposal at canning factories, milk plants, gravel washing and meat plants, as well as the inspection of water works and sewage disposal plants throughout the province.

Water Works Inspections

There were 1,068 routine or special inspections made by the district staff of water treatment plants, compared with

815 for 1961, 1,031 for 1962 and 1,218 for 1963. The total was made up of 524 municipal, 104 industrial, 31 military, 52 institutional and 263 private plant inspections. Samples totalling 1,923 bacterial, 1,473 chemical, and nine for other evaluations were obtained during the water works inspections, compared with 1,855 bacterial and 1,205 chemical in 1961 samples. In 1962 these were 2,673 and 1,508, and 2,256 and 1,604, respectively, in 1963.

The number of recorded water works inspection points increased from 489 in 1961, to 567 in 1962, to 690 in 1963 and to 758 in 1964, indicating the need for an increased number of inspections each year. The yearly inspection objective for the program was three visits for chlorinated municipal supplies, year-round-private, industrial, (including mines) with townsites, and one for systems not requiring disinfection, as well as summer-private and industrial, (including mines) not having townsites. During 1964, 1,003 routine inspections were made of the routine inspection points; this is 70 per cent of the objective of 1,473. The percentage of the objective achieved during 1961 was 54, in 1962 it was 72, and in 1963 it was 71.

The ultimate objective for water works inspections was three visits per year of all recorded supplies.

Wastewater Treatment Works

There were 1,728 regular and special inspections made during 1964 of wastewater treatment works serving municipalities and industry. The number of inspections compared with 1,175 inspections in 1961, 1,248 in 1962 and 1,434 in 1963. A total of 1,026 bacterial, 1,838 chemical and 25 other samples were obtained during these inspections. The 1962 totals were 961, 2,137 and 17, respectively, and 1,026, 1,838 and 20, respectively, in 1963.

The inspection objective for wastewater treatment facilities was three visits a year for secondary municipal sewage treatment plants, one inspection for septic tank facilities and two inspections per year for industrial wastewater treatment installations and primary municipal sewage treatment plants.

Sewage Treatment Plants and Septic Tank Installations

There were 535 inspections of sewage treatment plants and septic tank systems. This is 57 per cent of the objective of 946 inspections on the 398 points to be covered. The coverage during 1961 was 40 per cent of the objective on the 277 inspection points. In 1962, it was 60 per cent on 328 points. In 1963 it was 62 per

cent on 359 points. The annual increase in inspection points indicates the need for an increased number of inspections each year.

Canneries

There were 119 inspections made of canneries or 80 per cent of the objective of two inspections per year on the 74 tabulated canneries. The number of canneries in operation decreased from 82 in 1962 to 77 to 74, indicating a continued trend toward consolidation.

Milk Plants

During 1964, 240 inspections were made of the treatment facilities serving 376 milk plants, representing a coverage of 32 per cent. In 1962, 225 inspections were made. In 1963, 217 inspections were made.



Meat Plants

One hundred and seventy-nine inspections were made of the wastewater treatment facilities serving 293 meat processing plants, indicating a 31 per cent coverage. In 1962, 76 inspections were made. In 1963, 69 inspections were made, representing a 12 per cent coverage. It can be seen that this program received a 160 per cent increase in numbers of inspections. This is an aspect of the industrial waste disposal program of the District Engineers Branch and is being accelerated as staff is made available.

Other Industrial Waste Plants

Miscellaneous wastewater treatment facilities serving gravel-washing plants and other non-chemical industries are inspected by the staff of the branch. During the year, 97 inspections were made of the 93 recorded inspection points, indicating a 52 per cent coverage.

Meetings with Municipal Officials

The staff of the District Engineers Branch continued to have more direct contact with water works' and sewage works' officials and personnel throughout the province. During 1964, there were nine meetings with public utilities commissions and 73 with municipal councils. In addition, discussions were held with various municipal officials and were duly recorded. In this field, there were 394 discussions with municipal clerks, 443 with various other municipal officials, 87 with consulting engineers, 633 with health officials and 373 with other entities. This is an important aspect of the activities of the division as it brings about a direct contact between local officials and the Commission, and tends to produce projects for the Commission as well as installations by the entity concerned.

Special Investigations

Special investigations requested by municipalities, the public or senior staff of the Commission were time-consuming, and 1,007 of these were received in 1964 and 1,014 were completed. The previous year, 759 of the 839 received were completed. It was estimated this work required approximately 25 per cent of the time of the staff of the District Engineers Branch.

STREAM SANITATION BRANCH

The Stream Sanitation Branch mainly was responsible for water quality management throughout Ontario. In this program, stream surveys were conducted to determine whether water quality fell within the objectives of the Ontario Water Resources Commission for surface waters. Water pollution surveys were carried out in 129 municipalities to locate all actual and potential sources of surface and ground-water pollution. Sampling was done where necessary.

The reports on water quality and water pollution surveys provided the basis for most of the pollution abatement programs. These reports were made available to municipalities, industries, conservation authorities, consulting engineers and others.

The initiation of meetings with local officials to discuss the recommendations in these reports provided rewarding results in the development of needed pollution control measures.

The abatement of water pollution through the installation of municipal and industrial water pollution control plants presented problems in the disposal of concentrated liquid and solid wastes. Suitable land disposal areas were difficult to obtain and many municipalities prohibited dumping within corporate limits. Considerable time was spent in examining sites for suitability with respect to surface and ground-water pollution.

Existing and proposed solid waste disposal sites involving municipal or industrial refuse required 196 investigations.

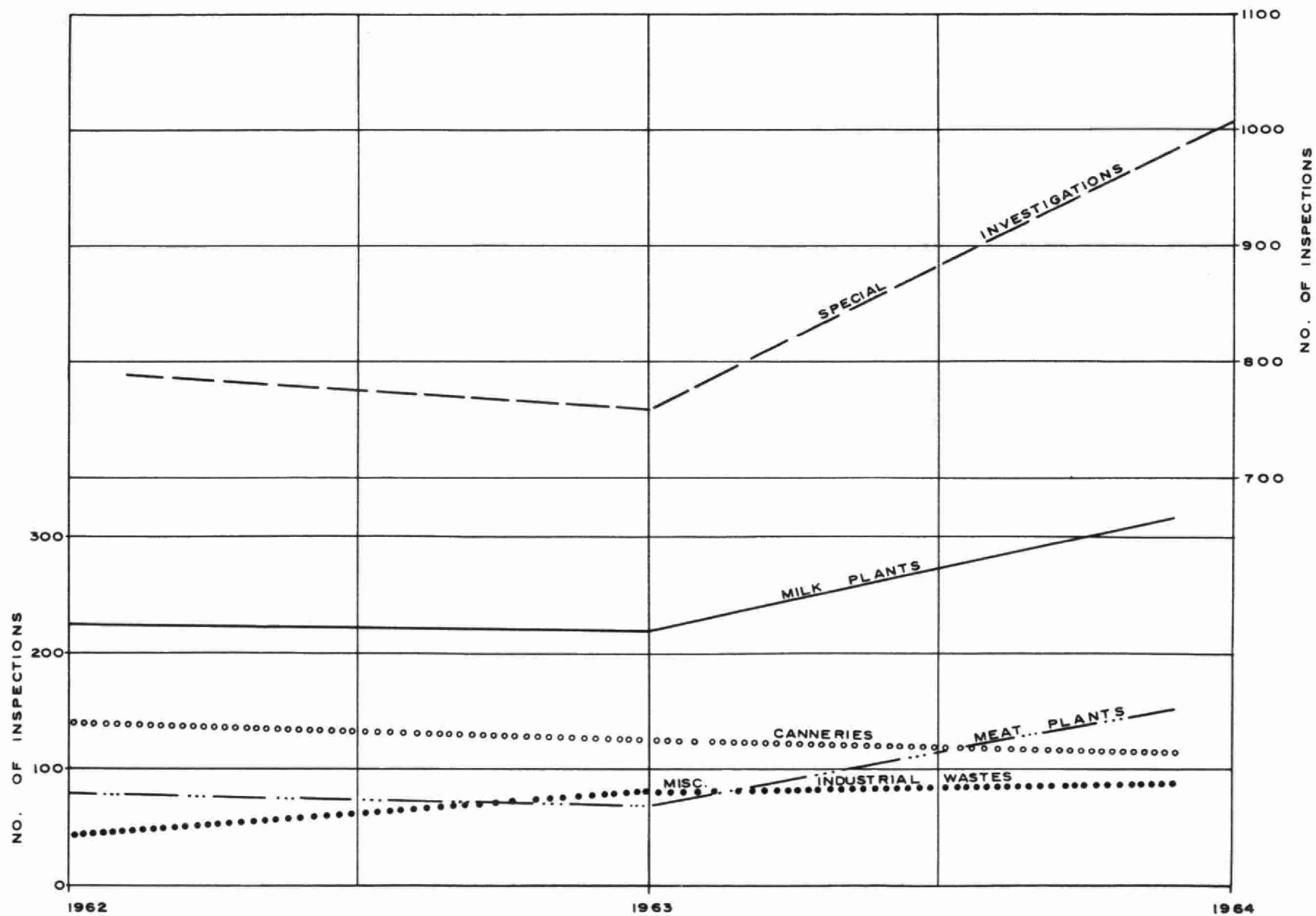
Water Quality and Water Pollution Surveys

The following summary indicates the activities of the District Engineers staff with respect to the number of water quality and water pollution surveys made in 1964, with comparative figures for 1963 and 1962.

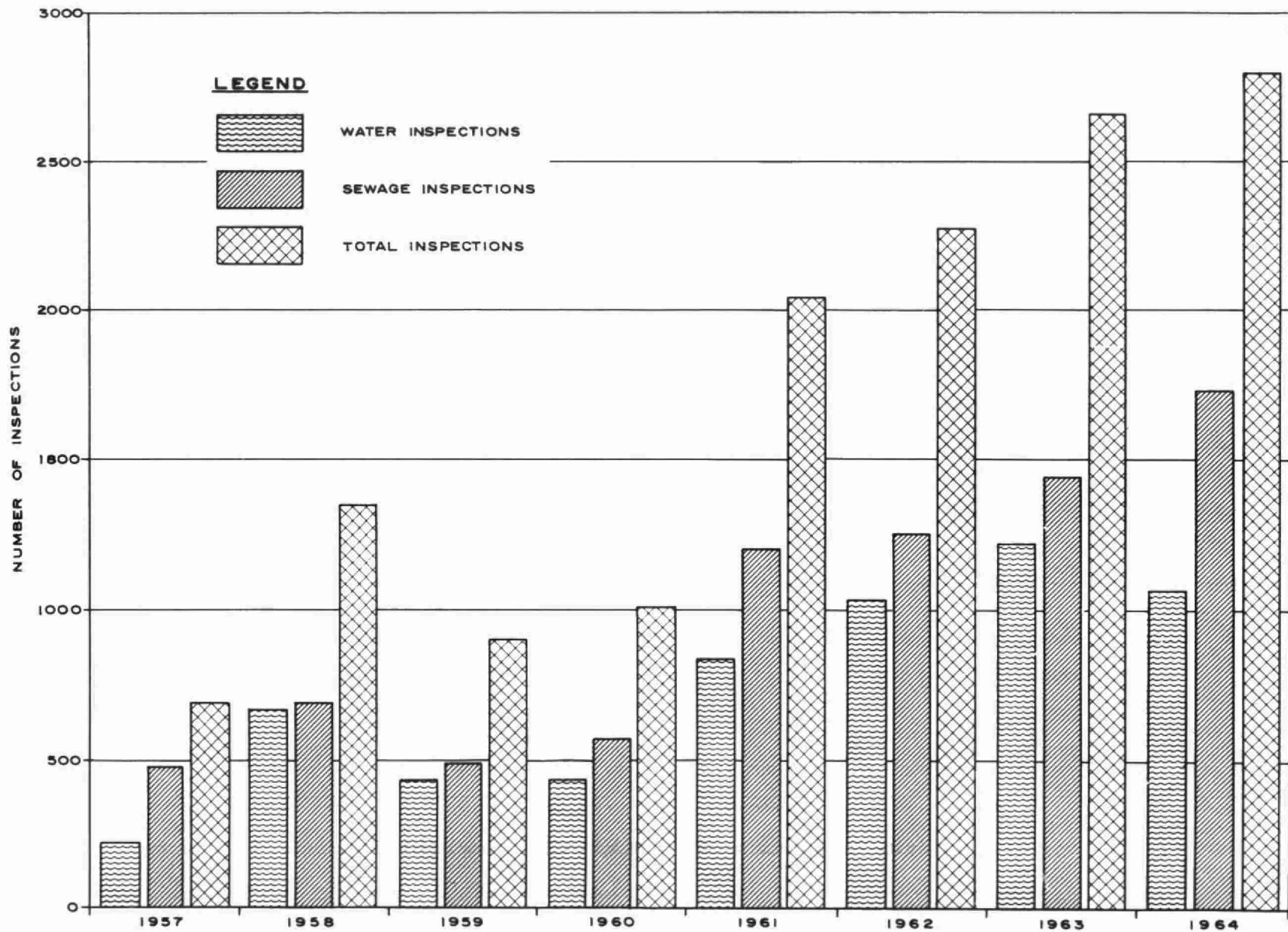
	<u>1964</u>	<u>1963</u>	<u>1962</u>
Water Quality Surveys	134	212	147
Water Pollution Surveys	129	72	105
Samples Collected-Bacterial	3,018	4,146	3,341
-Chemical	2,754	3,647	2,780
-Others	79	-	-

The significant decrease in the number of water quality surveys and related sampling could be attributed to the establishment of the water quality monitoring program by the Stream Sanitation Branch.

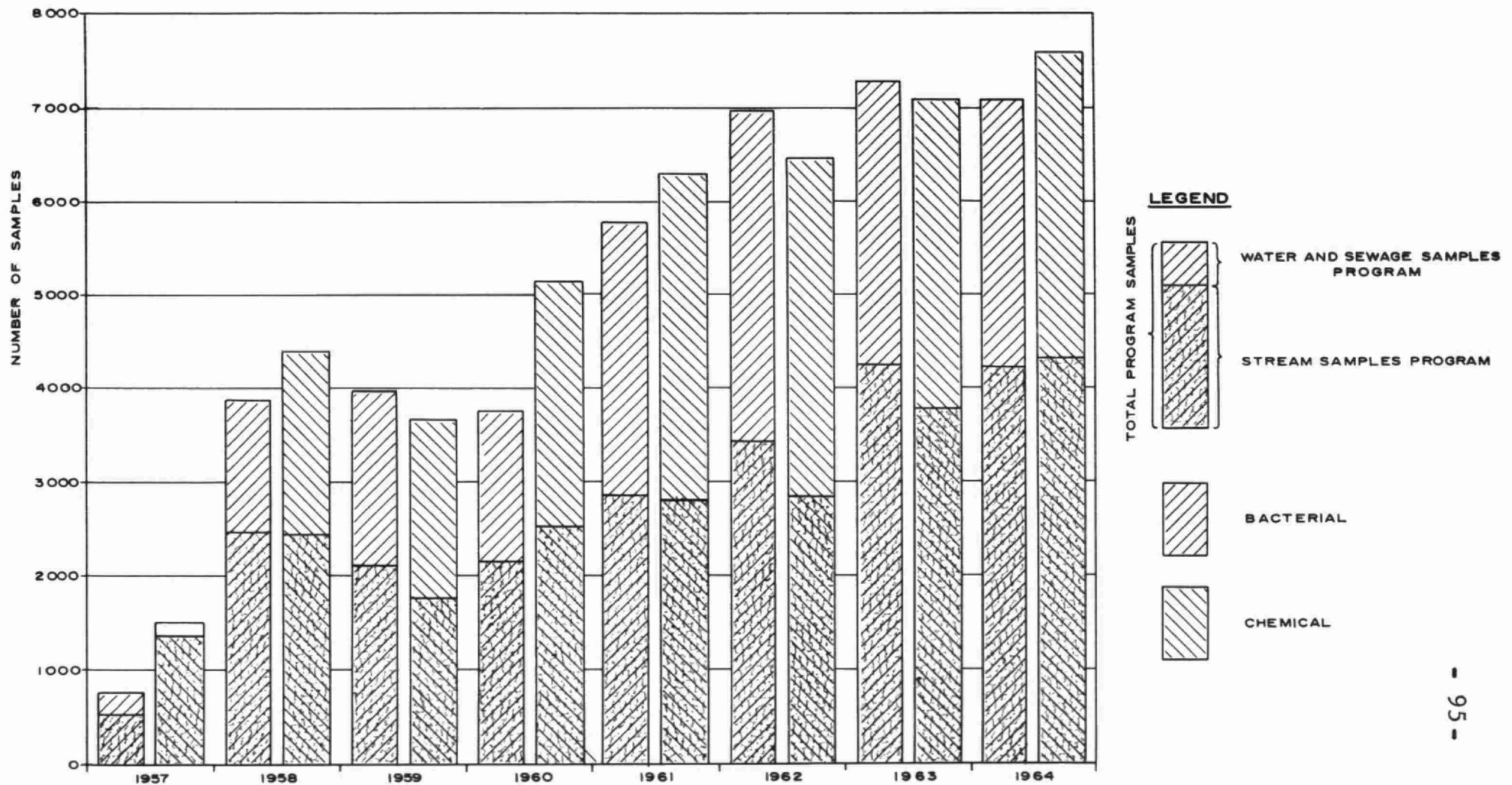
DIVISION OF SANITARY ENGINEERING INSPECTION PROGRAMS



DIVISION OF SANITARY ENGINEERING
INSPECTION PROGRAMS
WATER AND SEWAGE 1957-1964



DIVISION OF SANITARY ENGINEERING
SAMPLING PROGRAMS
WATER—SEWAGE—STREAMS
1957 — 1964



Prosecutions

Four charges were laid under Section 27 of The Ontario Water Resources Commission Act. Two involving cheese plants resulted in one conviction with the other being dismissed. The remaining two charges concerning a fish kill were to be heard in January.

County Survey Program

Again in 1964, the division, through the Stream Sanitation Branch, undertook the responsibility for correlating and expediting the county survey program.

These water resources studies reviewed the existing water supplies and water pollution control facilities, outlining the adequacy of these works and any required improvements. Further considerations were the requirements of areas not serviced with communal water and sewerage systems. The quality of surface waters and to some extent ground waters also were surveyed to determine the works necessary to protect water quality.

The ultimate aim of the surveys was to make recommendations concerning general policies to be followed in the field of water supply and water pollution control.

Surveys of four counties, Brant, Frontenac, Halton and Welland were made in 1964 in co-operation with the divisions of Laboratories and Water Resources. The County of Welland report was published in 1964. The remaining reports were to be published in 1965. The County of Norfolk report, following a survey in 1963, was published in April, 1964.

Draughting Services

Five draughtsmen were engaged in the preparation of watershed plans, municipal maps, graphs and other assignments to complement the water pollution abatement program. Services performed for other divisions of the Commission included work on brochures for official openings, OWRC-municipal projects, displays for OWRC exhibits and other Commission public relations programs.

The following chart summarizes the number of assignments completed in 1964 with comparative figures for 1963 and 1962.

	<u>1964</u>	<u>1963</u>	<u>1962</u>
Municipal Pollution Survey Plans	207	175	108
Graphs and Diagrams	417	243	147
Charts	8	-	-
Watershed Plans	11	68	7
Projects	2	4	33

The time spent on draughting services to other divisions amounted to 31.5% of the total.

Expansion of the Stream Surveys Program

The Stream Sanitation Branch expanded in 1964 with the addition of three field personnel who were mainly concerned with the following programs:

- (i) Water Quality Monitoring
- (ii) Assimilation Studies
- (iii) Special Studies
- (iv) Co-operative Water Quality Studies

Water Quality Monitoring

There were 163 stations selected to provide water quality information for use in evaluating pollution control measures and in future planning. In the latter half of 1964, each station was sampled four times. The majority of the chemical samples taken were analyzed for 13 parameters.

In 1965, the water quality monitoring program was to replace the once-a-year grab sampling survey previously performed by the District Engineers Branch.

Assimilation Studies

The assimilation study projects were designed to investigate the ability of streams in Ontario to accept waste loadings. Concentrated stream sampling and flow measurement data could be used to predict ultimate stream waste loading capacities and sewage treatment required on the various watersheds.

Assimilation studies were conducted on Duffin and Black creeks downstream from Stouffville and Acton, respectively.

Special Studies

Four special studies were performed in 1964, including the Elliot Lake water quality investigations. Plans for intensive field investigations of radiological pollution at both Elliot Lake and the Bancroft area were being developed. These surveys were to be commenced in the spring of 1965.

Studies were made of the effects on Lake Ontario of waste discharges from the St. Lawrence Starch Co. Ltd., at Port Credit; the pollution of the Welland River from municipal and industrial waste discharges at Welland, and Moira Lake algae blooms. In connection with the Moira River system, studies proceeded on the arsenic pollution problem below Deloro.

Co-operative Water Quality Studies

Stream sampling programs were arranged with the conservation authorities on the Maitland, Moira and Raisin rivers. The authorities provided the field staff who sampled the rivers at stations determined by the OWRC. All samples were sent to the Commission laboratory for analysis. Regular sampling also was carried out by the City of London and the Naugatuck Chemical Company Limited on the Thames River at London and Canagagigue Creek at Elmira, respectively.

Data on sampling carried out on the Don River by the Metropolitan Toronto Department of Works was to be combined with material obtained by the Sanitary Engineering staff to form a complete report on the watershed.

Water quality, waste loading and flow data were supplied to the United States Public Health Service to assist in pollution studies being carried out on Lake Erie. Similar studies were proposed for Lakes Ontario and Huron.

PLUMBING BRANCH

There were no major changes in the organization or objectives of the Plumbing Branch in 1964.

The municipal plumbing survey which was commenced in 1963 was completed, the returns were evaluated, and subsequently included in a report.

The amendments to Regulation 471 which were under consideration in 1963 were finalized by the Plumbing Advisory Committee

and one part was adopted by Order-in-Council. The remainder received approval in principle and final legal drafting was in progress as the year ended.

Liaison with plumbers and inspectors in the field was maintained through attendance of zone meetings in all eight inspector zones, as well as the annual conventions of the Plumbers and Mechanical Contractors Association and the Ontario Plumbing Inspectors Association.

Numerous requests for information, special investigations and several speaking engagements were handled in a routine manner.

WATER AND SEWAGE WORKS OPERATORS' COURSES

Basic and Intermediate courses for water works operators were held during the year with attendances of 97 and 77 operators, respectively.



There were two courses of instruction for sewage works operators with 83 operators attending the intermediate school and 76 operators at the senior course. Certificates of qualification were to be issued to the successful candidates completing the three courses of instruction.

Since the inception of the training courses for water and sewage works operators, certificates of qualification had been granted to 119 water works operators and 186 sewage works operators to the end of 1964.

DESIGN APPROVALS BRANCH

This branch of the division evaluated and made recommendations to the Commission on engineering reports, plans and specifications submitted for the approval of water works, sewage works and certain industrial waste treatment installations in accordance with Section 30 and Section 31 of The OWRC Act.

The branch also reviewed and made recommendations to the Ontario Department of Municipal Affairs on water works and sewage works requirements for subdivision draft plans and official plans submitted in accordance with Section 26 and Section 12 of The Planning Act.

Special assignments from the Commission, such as water supply pipeline studies, and requests for information from the public and other government agencies were handled by the branch.

The statistical section recorded chemical and bacteriological analyses results submitted by the OWRC and the Ontario Department of Health laboratories and prepared data on construction costs and process operating results from information collected by all branches of the division.

Water Supply Pipeline Studies

During the year, the engineers of the branch participated in a number of pipeline studies.

These included cost estimates for supplying water to intermediate municipalities along the Lake Huron water supply system; a report on a pipeline from Lake Ontario to serve the Brampton-Chinguacousy area in Peel County; a report on a high pressure pipeline from Lake Erie to serve the City of Brantford and intermediate municipalities; and a general pipeline feasibility study for the whole province.

Also a literature review was made on the design and cost of pipelines based on United States engineering practice.

Water Works Construction Costs

In response to various requests and to facilitate water pipeline feasibility studies, the branch prepared a file on water works construction costs with information obtained from OWRC application forms, OWRC contract prices, and articles in the technical literature.

The file was complete at the year-end with the exception of costs for well supply pumphouses, with and without treatment.

Certificates of Approval

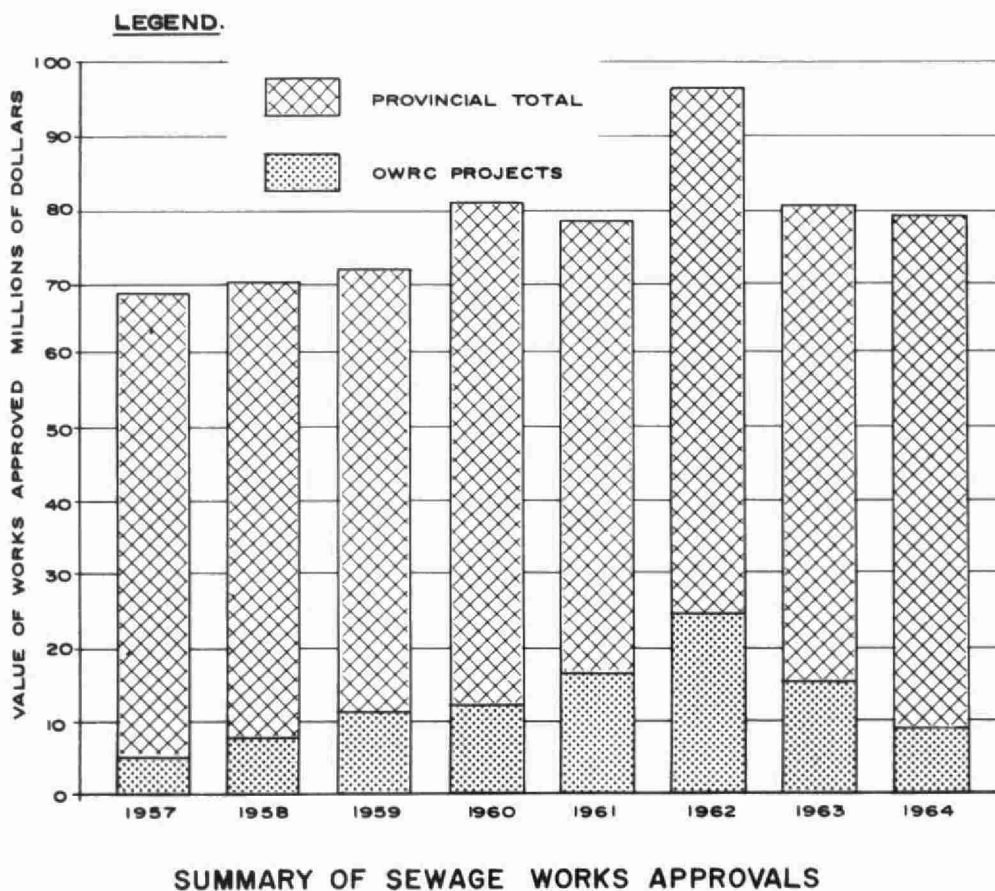
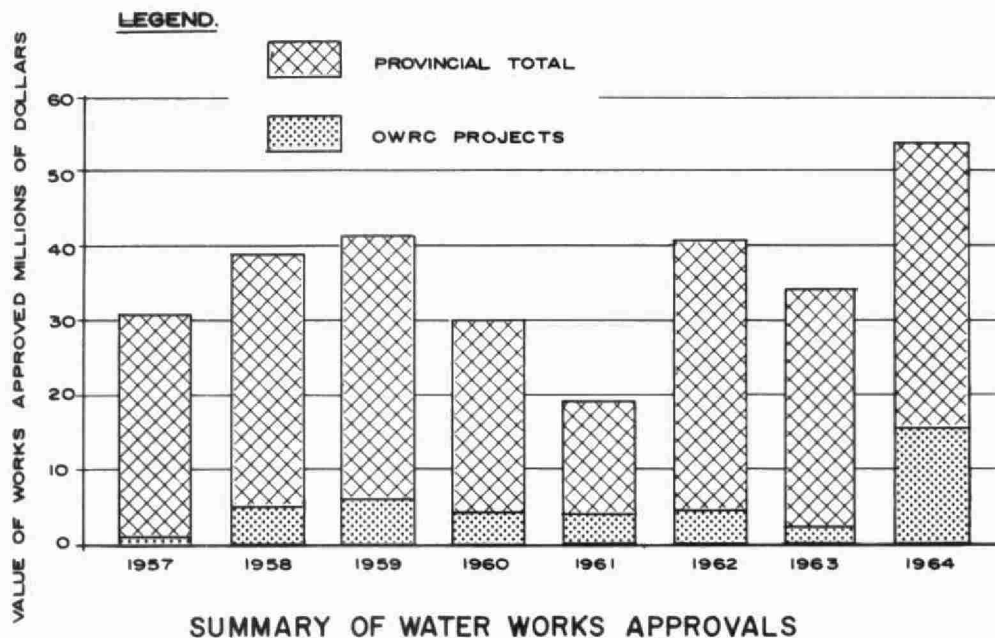
In 1964, certificates of approval were issued for each of 1,668 proposed water works, sewage works and industrial waste facilities at a total estimated cost of \$134,634,078.33. This compared with 1,686 certificates in 1963 at a total estimated expenditure of \$114,923,471.57.

Certificates issued for water works installations totalled 727 and called for an estimated expenditure of \$54,961,748.83, compared with 698 certificates and an expenditure of \$33,456,802.65 for 1963.

In the wastewater field, 941 certificates were issued during the year at an estimated cost of \$79,672,329.50, against 988 approvals in 1963 at an estimated cost of \$81,466,668.92.

Of the total certificates issued in 1964, 32 were for OWRC water works projects and 68 were for OWRC sewage works projects. Estimated costs of the projects were \$16,384,558.69 for water works and \$8,471,577.32 for sewage works. This figure for water works included the Lake Huron water supply system at a total estimated cost of \$14,600,000.00. Commission projects accounted for 18.5 per cent of the total value of certificates issued in 1964. Last year, 121 OWRC projects were approved at a total estimated cost of \$17,068,825.30, or represented 14.8 per cent of the value of all 1963 certificates.

DIVISION OF SANITARY ENGINEERING DESIGN APPROVALS BRANCH



S U M M A R Y

<u>Water Works</u>	<u>Estimated Cost</u>
Extensions to existing systems.....	\$35,649,202.52
Supply and purification.....	18,275,047.31
New Systems.....	1,037,499.00
TOTAL	<u>\$54,961,748.83</u>
 <u>Sewage Works</u>	 <u>Estimated Cost</u>
Extensions to existing systems.....	\$69,715,900.86
Treatment and disposal works.....	7,005,588.40
New Systems.....	2,950,840.24
TOTAL	<u>\$79,672,329.50</u>
 Total Water and Sewage Works	 <u><u>\$134,634,078.33</u></u>



CERTIFICATES ISSUED RE WATER WORKS FOR THE YEAR 1964

MUNICIPALITY	No. of Certi- ficates	Extensions to existing systems	Supply and Purification	New Systems
Ajax	2	189,664.50		
Alexandria	1	13,810.00		
Alfred	1	1,850.00		
Almonte	1	1,900.00		
Alvinston	1	7,170.00		
<u>Ameliasburg Twp.</u>				
(Stanley Park Ltd.)...1			21,880.00	
(T.H.Hancock Ltd.)...1			8,000.00	
Ancaster Twp.	3	317,857.00	60,000.00	
x-Anderdon & Colchester				
North Twps.....1				230,049.00
Atikokan Twp.	1	68,700.00		
Aylmer	1	4,850.00		
Balmertown I.D.	1	13,660.76		
Barrie	7	108,987.66		
Beamsville	1	13,950.00		
Beaverton	1	750.00		
Beeton	1	3,500.00		
Belleville	5	50,612.50		
<u>Belleville</u>				
(Almo Development				
Ltd.).....1		24,965.00		
(Mr. C. Lambert)...1		11,519.00		
Belmont	2	3,088.20		
Bertie Twp.	5	66,702.00		
Blenheim	1	3,400.00		
x-Bobcaygeon	1			+234,700.00
Bolton	1	2,879.00		
Bowmanville	2	19,971.65		
<u>Bowmanville</u>				
(Ontario Dept. of				
Public Works).....1			99,800.00	
Brampton	4	93,021.60		
x-Brampton	1		+312,800.00	
<u>Brampton</u>				
(Guano Development				
Ltd.,Port Credit)..1		10,845.00		
Brantford	9	197,940.49		
<u>Brantford</u>				
(H. & L. Construction				
Co.Ltd.,Weston)...1		6,200.00		

WATER WORKS CERTIFICATES (cont'd)

MUNICIPALITY	No. of Certi- ficates	Extensions to Existing Systems	Supply and Purification	New Systems
Brantford Twp.	1	35,000.00		
Bridgeport	2	15,925.00		
<u>Brighton Twp.</u>				
(Dept. of Justice, Ottawa).....	1		341,150.00	
<u>Bruce Twp.</u>				
(Atomic Energy of Canada).....	1		--	
Brussels	1		8,032.43	
x-Bucke Twp.				
(North Cobalt Townsite).....	1			+138,355.00
Burlington	15	350,765.03		
<u>Burlington</u>				
(Mak-Ver Ltd.)....	1	7,678.00		
(Verhoeven Construc- tion Ltd.).....	2	17,742.00		
(C.F.M. Investments Ltd.).....	1	18,530.00		
<u>Burwash</u>				
(Ontario Dept. of Public Works)....	1		180,500.00	
x-Cache Bay	1			+165,000.00
Caledonia	4	15,398.00	5,300.00	
Campbellford	1	12,712.80		
Capreol	1	8,215.00		
Cardinal	1	57,860.00		
<u>Chaffey Twp.</u>				
(Hidden Valley Ski Resort, Huntsville)	1			42,530.00
x-Chalk River	1	137,784.91		
<u>Charlotteville Twp.</u>				
(Mr. C. E. Booth, Simcoe).....	1	4,450.00		
Chatham	4	25,648.00		
Chatham Twp.	3	21,020.00		
Chesterville	1	3,600.00		
Chinguacousy Twp.	1	7,325.50		
Clifford	1		10,344.00	
<u>Clinton Twp.</u>				
(Police V. of Vineland)	2	100,000.00	802.00	

WATER WORKS CERTIFICATES (cont'd)

MUNICIPALITY	No. of Certi- ficates	Extensions to Existing Systems	Supply and Purification	New Systems
Cobourg	1		479,697.62	
Cochrane	1	22,790.00		
<u>Collingwood Twp.</u> (Great Lakes Water Co. Ltd., Toronto).....	1		40,700.00	
Cornwall	3	237,572.94		
Cornwall Twp.	1	1,600.00		
<u>Cumberland Twp.</u> (Parks & Gardens Home Developments Ltd.)..	1	52,740.00		
Deep River	1	49,700.00		
Delhi	1	16,035.00		
<u>Dereham Twp.</u> (Messrs. Gorman & High, Tillsonburg)...	2	7,421.00	3,500.00	
(Mount Elgin Co-opera- tive Water System)..	1		6,238.72	
(Brownsville Co-opera- tive Water System)..	1	530.00		
x-Deseronto	1		+235,004.00	
Dryden	1	13,594.75		
Dundas	2	35,200.00		
Dunnville	1		30,000.00	
Durham	2	8,891.02	17,974.00	
Dutton	1	15,000.00		
Eganville	1	6,200.00		
x-Eganville	2			162,550.00
<u>Elliot Lake</u> (Stanrock Uranium Mines Ltd.).....	1		1,800.00	
Elmira	4	140,585.00		
<u>Elmira</u> (Naugatuck Chemicals)	1	4,252.00		
Ernestown Twp.	3	57,304.32	40,000.00	
<u>Ernestown Twp.</u> (R.F. Cutway).....	1		26,837.30	
x-Espanola	1		3,090.00	
Etobicoke Twp.	29	885,704.96		
Exeter	3	10,614.10		

WATER WORKS CERTIFICATES (cont'd)

MUNICIPALITY	No. of Certi- ficates	Extensions to Existing Systems	Supply and Purification	New Systems
Fenelon Falls	2	5,882.00		
Fergus	1	10,000.00		
<u>Fergus</u> (Wm. Ferguson, Orangeville).....	1	7,637.00		
Ferris West Twp.	1		+433,000.00	
Fort Erie	2	25,561.50		
Fort Frances	2	27,124.58	221,000.00	
Frankford	1	1,132.50		
Freeman Twp. (MacTier).....	1		58,000.00	
Galt	7	101,898.50		
Gananoque	1	66,000.00		
Glencoe	1		16,521.72	
Gloucester Twp.	5	321,253.49	5,000.00	
x-Gloucester Twp. (Orleans Area).....	1			+387,400.00
Goderich	1	900.00		
Grand Bend	1	46,700.00		
<u>Grimsby North Twp.</u> (Grimsby Develop- ments Ltd.).....	1	41,158.39		
Guelph	1	294,000.00		
Hagersville	1	4,450.00		
Hamilton	29	4,527,485.00		
<u>Harvey Twp.</u> (Sumcot Development Corp.Ltd.).....	1		15,433.00	
Hawkesbury	1	28,700.00		
<u>Hay Twp.</u> (Mr. Wm. Ducharme)	1	490.00		
Huntsville	1	30,000.00		
Ingersoll	2	1,450.00	52,913.00	

WATER WORKS CERTIFICATES (cont'd)

MUNICIPALITY	No. of Certi- ficates	Extensions to Existing Systems	Supply and Purification	New Systems
Kemptville	4	8,900.00	60,000.00	
<u>Kemptville</u>				
(Mr. M. Kotlarchuk)	1	8,000.00		
Kenora	2	66,825.00		
Kincardine	1	10,000.00		
Kingston	9	611,092.82		
<u>Kingston</u>				
(Mr. B. R. Barrett)	1	3,152.84		
(Mr. W.A. Killoran)	1	5,888.00		
(Homestead Land Holdings).....	1	94,600.00		
Kingston Twp.	6	97,216.50	11,500.00	
Kingsville	4	46,935.00		
Kitchener	3	266,113.00		
Korah Twp.	1	18,800.00		
<u>Korah Twp.</u>				
(Mr. W.A. Rodman)....	1	32,190.00		
Lakefield	1	5,573.20		
x-Lanark	1		+196,000.00	
Leaside	2	23,200.00		
Lindsay	4	48,231.76		
Listowel	1	18,480.00		
London	10	869,766.00	14,715,500.00	
<u>London</u>				
(Sifton Construction Co. Ltd.).....	1	75,960.00		
(Mr. H.E. Thorne)....	1	11,400.00		
(Lockwood Park Development Ltd.)..	1	28,250.00		
(Mr. M.P. Robinson)...	1	14,670.00		
(S.H. Elgie & Sons Ltd.).....	1	2,311.50		
(Evancraft Ltd.)....	1	7,200.00		
<u>Longlac Twp.</u>				
(Kimberly-Clark Pulp & Paper Co.).....	1	59,831.00		
McDougall Twp.	1	8,825.00		

WATER WORKS CERTIFICATES (cont'd)

MUNICIPALITY	No. of Certi- ficates	Extensions to Existing Systems	Supply and Purification	New Systems
Maidstone Twp.	1	6,414.00		
x-Maidstone, Gosfield N. & Rochester Twps.)..1				189,710.00
March Twp.				
(March Ridge Develop- ment Ltd., Ottawa)..1				270,660.00
Markham	2	32,600.00	+50,000.00	
Markham Twp.	6	105,888.82		
Markham Twp.				
(Colmur Construction Ltd.).....1		40,000.00		
x-Marmora	1	+55,644.00		
Matheson	1	5,930.00		
Merrickville	1	3,990.00		
Mersea Twp.	2	18,872.00		
x-Michipicoten Twp.	2	7,065.36	+138,000.00	
Milton	3	121,000.00	29,450.00	
Mimico	1	44,000.00		
Mitchell	1	16,520.00		
Moore Twp. (P.V. of Corunna).....2		24,218.00		
Mount Forest	1	7,248.54		
x-Nakina I.D.	1	+130,000.00		
Napanee	2	27,395.20		
Neelon & Garson Twps.	1	3,550.00		
Nepean Twp.	4	95,864.64		
Nepean Twp.				
(T.F.S. Realty Co. Ltd.).....1		52,017.00		
(Minto Construction Ltd., Ottawa).....1		39,704.00		
Newmarket	1	257,900.00		
New Liskeard	1	5,350.00		
Niagara Falls	8	532,960.00		
Niagara Twp.				
(Jockey Club Ltd., Downsview).....2		216,000.00		
Nichol Twp.				
(Mr. S. Elgie, Fergus) 1			3,710.00	

WATER WORKS CERTIFICATES (cont'd)

MUNICIPALITY	No. of Certi- ficates	Extensions to Existing Systems	Supply and Purification	New Systems
Nipigon Twp.	1	10,556.00		
North Bay	3	46,191.26		
Oakville	5	598,178.51		
<u>Oakville</u> (Atlas Plastics Ltd.).....	1	4,030.00		
(Rebecca Builders Ltd.).....	1	7,523.40		
Orangeville	4	208,320.00		
Orillia	5	42,122.68		
Orillia Twp.	10	74,157.26		
Oshawa	20	752,747.95		
Ottawa	17	827,270.00		
<u>Oxford North Twp.</u> (Thamesford Realty Co., London).....	1	14,132.00		
Paris	7	125,979.74	+294,000.00	
Parry Sound	2	105,000.00		
Pembroke	4	29,881.35		
Penetanguishene	3	14,026.65		
Perth	1	15,825.00		
Peterborough	8	264,673.79		
Petrolia	3	12,465.00		
Pickering Twp.	1	136,984.00		
<u>Pictou</u> (Prince Edward County).....	1	3,368.26		
<u>Pittsburgh Twp.</u> (Trans-Canada Pipe Lines Ltd., Toronto)	1		8,600.00	
x-Plantagenet	1		+24,500.00	
Point Edward	1	92,770.00		
x-Point Edward	1	+14,430.00		
Port Arthur	7	310,371.50		
Port Colborne	1	3,953.50		
x-Port Colborne	1	2,000.00		
Port Elgin	1	6,800.00		
Port Hope	1	7,000.00		
Port Credit	1		13,300.00	

WATER WORKS CERTIFICATES (cont'd)

MUNICIPALITY	No. of Certi- ficates	Extensions to Existing Systems	Supply and Purification	New Systems
Port McNicoll	2	3,274.85	5,480.00	
Port Perry	3	5,592.28		
Preston	2	25,759.00		
x-Rayside Twp.	1			+336,000.00
Ridgetown	1	2,482.00		
St. Clair Beach	1	4,030.00		
St. Thomas	2	37,652.00	65,000.00	
Saltfleet Twp.	5	72,796.90		
x-Saltfleet Twp.	1	174,498.90		
<u>Saltfleet Twp.</u>				
(E. D. Smith & Sons				
Winona).....	1	68,500.00		
Sandwich East Twp.	6	238,227.67		
Sandwich West Twp.	8	280,426.60		
Sarnia	7	90,350.00		
<u>Sarnia</u>				
(Sarnia Lumber & Builders				
Supply Ltd.).....	1	13,570.00		
Sarnia Twp.	1	5,900.00		
Sault Ste. Marie	1	103,600.00		
x-Sault Ste. Marie	2	415,000.00		
Scarborough Twp.	23	639,282.24		
Schreiber Twp.	1	14,000.00		
Simcoe	1	3,030.00		
Smiths Falls	1	85,000.00		
Smooth Rock Falls	1	6,210.00		
x-Southampton	1		332,000.00	
Southampton	1	6,016.34		
Stafford Twp.	2	14,563.75		
<u>Stanley Twp.</u>				
(Mr. R. Grainger,				
Zurich).....	1		4,275.00	
Stoney Creek	3	25,300.00		
Stratford	5	63,380.00	862,208.52	
<u>Stratford</u>				
(Oberlander Construction				
Co., Waterloo).....	1	35,600.00		
Strathroy	1	3,665.00		

WATER WORKS CERTIFICATES (cont'd)

MUNICIPALITY	No. of Certi- ficates	Extensions to Existing Systems	Supply and Purification	New Systems
Sturgeon Falls	2	26,405.00		
Sudbury	5	17,634.00	+255,000.00	
<u>Sudbury</u>				
(Thor Investments Ltd.).....	1	36,627.00		
(Trend Realty Co.)..	1	10,197.60		
Sutton	1	16,700.00		
 Tarentorus Twp.	2	21,284.25		
<u>Tarentorus Twp.</u>				
(Suburban Developments Ltd., Sault Ste. Marie)	1	33,929.00		
Thorold Twp.	5	50,470.00	+264,957.83	
Tilbury	1	1,977.00		
Tilbury North Twp.	2	13,179.00	+202,400.00	
Tillsonburg	3	32,716.35		
Tillsonburg	1	+447,000.00		
Timmins	2	41,186.01		
Toronto Twp.	31	3,362,851.51		
<u>Toronto Twp.</u>				
(Edrich Construction Co. Ltd.).....	1	10,299.65		
(Mr. C. Zamaria).....	1	1,480.60		
(Rogerswood Estates)..	1	29,943.20		
(Paronal Construction Ltd., Brampton).....	1	75,647.00		
Toronto Metro	12	8,963,650.00	100,000.00	
Tottenham	1	2,500.00		
Trenton	5	81,557.61		
Tweed	1	1,390.00		
 Uxbridge	1		71,710.00	
 x-Vankleek Hill	1			+323,900.00
Vaughan Twp.	5	352,980.00		
Victoria Harbour	1	1,500.00		
x-Victoria Harbour	1		+171,000.00	

WATER WORKS CERTIFICATES (cont'd)

MUNICIPALITY	No. of Certi- ficates	Extensions to Existing Systems	Supply and Purification	New Systems
Wallaceburg	2	14,260.00		
Waterford	2	58,300.00	44,500.00	
Waterloo	5	113,150.00		
Watford	1	1,300.00		
Welland	6	432,695.00		
Wellesley				
(Mr. J. P. Wagner)...	1	3,144.00		
Whitby	5	318,758.50	193,300.00	
Whitby Twp.	1	1,265.00		
White River I.D.	1	90,155.00		
Whitney Twp.				
(Ontario Dept. of Public Works).....	1			142,000.00
x-Wicksteed Twp.	1			+219,800.00
Widdifield Twp.	3	34,967.69		
Williamsburg Twp.				
(Rohm & Haas Co., Westhill).....	1	47,000.00		
Wilmot Twp.				
(Mr. H. Knifel, Petersburg).....	1	20,920.00		
Winchester	1	3,910.00		
x-Winchester	1		+18,000.00	
Windsor	2	346,550.00		
Woodbridge	1	12,000.00		
Woodstock	2	83,300.00		
York Twp.	2	39,970.00		
York East Twp.	2	6,500.00		
York North Twp.	36	1,379,011.94		
Zorra East Twp.				
(Innerkip Homesites Company).....	1	9,000.00		
TOTALS	727	\$35,649,202.52	\$18,275,047.31	\$1,037,499.00

x- OWRC project

+ preliminary approval only - included in total number of certificates, not included in total estimates

CERTIFICATES ISSUED RE SEWAGE WORKS FOR THE YEAR 1964

MUNICIPALITY	No. of Certi- ficates	Extensions to Existing Systems	Treatment and Disposal	New Systems
Acton	1	53,000.00		
Alexandria	3	30,880.00		
Almonte	2	50,089.00		
x-Armstrong Twp.	1			+120,480.00
Athens	1	39,770.00		
Aylmer	1	50,614.00		
Balmertown I.D.	1	9,545.55		
Barrie	11	441,948.07		
<u>Barrie</u>				
(Crosley-Bernick Construction).....	1	5,325.00		
(Gordhome Development Ltd.).....	1	20,928.56		
Beamsville	1	6,000.00		
Belleville	7	165,253.00		
x-Black River Twp.	1			63,748.00
Bolton	1	2,500.00		
Bowmanville	3	92,307.88		
Bradford	2	96,000.00		
Brampton	3	86,517.00		
x-Brampton & Chinguacousy Twp.....	1		1,100,000.00	
Brantford	15	967,813.00	3,101.67	
<u>Brantford</u>				
(H. & L. Construction Co.Ltd.,Weston).....	1	14,300.00		
Brantford Twp.	1	46,959.54		
x-Brighton	3			187,980.00
Brockville	1	4,020.00		
x-Bucke Twp.	1			+174,831.00
Burlington	30	1,908,192.72		
<u>Burlington</u>				
(Notre Dame Academy)..	1		81,287.00	
(Verhoeven Construc- tion Ltd.).....	2	42,218.00		
(Tridon Manufacturing Ltd.).....	1		11,000.00	
(J.H.Mooradian Ltd.)..	1	157,706.00		
Caledonia	2	84,477.00		
Campbellford	1	3,652.80		
x-Campbellford	1		+490,000.00	

SEWAGE WORKS CERTIFICATES (cont'd)

MUNICIPALITY	No. of Certi- ficates	Extensions to Existing Systems	Treatment and Disposal	New Systems
Capreol	5	82,429.50	165,000.00	
Chatham	6	66,931.00		
x-Chatham	6	1,763,100.00		
x-Chelmsford	1		+46,000.00	
Chesley	1	1,590.00		
Chinguacousy Twp.	1	51,750.00		
<u>Chinguacousy Twp.</u> (Maple Lodge Farms Ltd.).....	1		7,000.00	
Chippawa	1	23,800.00		
Cobourg	4	53,619.31		
x-Cobourg	1		+840,000.00	
Cochrane	1	129,670.00		
Colborne	1			230,000.00
Collingwood	1	78,000.00		
Cornwall	11	178,949.45		
x-Cornwall	2	902,000.00		
x-Cumberland Twp.	1	+39,500.00		
x-Cumberland Twp. & Gloucester Twp.....	1		+375,000.00	
<u>Cumberland Twp.</u> (Parks & Gardens Home Development Ltd.)..	1	44,775.00		
Deep River	1	15,420.00		
Delhi	1	51,179.00		
<u>Delhi</u> (Julia Callens).....	1	11,271.00		
<u>Denison Twp.</u> (Whitefish public school).....	1		5,000.00	
Dryden	3	17,664.30	+900,000.00	
Dundas	4	116,740.00		
Dunnville	1		+543,000.00	
<u>Dunwich Twp.</u> (Canadian Oil Co.)..	1		26,600.00	
(B. A. Oil Co.).....	1		19,288.00	
x-Durham	2			354,170.00
Eastview	2	504,635.00		

SEWAGE WORKS CERTIFICATES (cont'd)

MUNICIPALITY	No. of Certi- ficates	Extensions to Existing Systems	Treatment and Disposal	New Systems
<u>Elizabethtown Twp.</u>				
(Burnbrae Farms Ltd., Lyn).....	1		850.00	
Elmira	2	29,196.00		
x-Elmvale	1	94,000.00		
x-Elora	1	10,776.15		
x-Englehart	1		90,300.00	
Ernestown Twp.	1	116,413.20		
Etobicoke Twp.	56	3,275,485.77		
Exeter	3	93,107.65		
Fergus	1	12,890.00		
<u>Fergus</u>				
(Wm. Ferguson, Orangeville).....	1	2,824.00		
Forest Hill	1	7,200.00		
Fort Erie	1	4,444.75		
Fort Frances	3	526,168.82		
Fort William	3	171,019.75		
x-Fort William	4	776,500.00		
<u>Fort William</u>				
(Ontario Dept. of Public Works).....	1		43,000.00	
Frankford	1	3,738.00		
Galt	5	382,908.21		
Gananoque	1	95,000.00		
Gloucester Twp.	1	636,100.00		
x-Gloucester Twp.	1			+235,500.00
Goderich	1		+545,000.00	
<u>Gogama</u>				
(Ontario Dept. of Public Works).....	1		90,000.00	
<u>Gravenhurst</u>				
(Ontario Dept. of Public Works).....	1		183,000.00	
Grimsby North Twp.	2	41,715.00	12,000.00	
<u>Grimsby North Twp.</u>				
(Grimsby Development Ltd., Toronto).....	1	44,500.52		

SEWAGE WORKS CERTIFICATES (cont'd)

MUNICIPALITY	No. of Certi- ficates	Extensions to Existing Systems	Treatment and Disposal	New Systems
Gwillimbury E. Twp.	1	20,500.00		
Gwillimbury N. Twp.	1	7,300.00		
Hagersville	1	3,750.00		
Hamilton	11	2,600,179.00		
<u>Hamilton</u>				
(Abbotsford Properties Hamilton Ltd.).....	1	46,400.00		
(Patt-Nadel Develop- ment Co.Ltd.).....	1	9,430.00		
(Cochren Construction Co.Ltd.).....	1	8,804.00		
(J. Gollob Construc- tion Ltd.).....	1	6,600.00		
(Pendevco Development Co.Ltd.).....	1	19,900.00		
(Kislak Construction Co.Ltd.).....	1	15,100.00		
(Queenston Develop- ment Co.Ltd.).....	1	35,200.00		
(Robert Shelley Con- struction Co.Ltd.)..	1	5,100.00		
(John B. Robinson Con- struction Co.Ltd.)..	1	102,420.00		
(Seebeck Construction Co.Ltd.).....	1	8,160.00		
(Dundana Homes Ltd.)	1	35,159.00		
(DiCenzo Construction Co.Ltd.).....	1	9,100.00		
(R.A. Garside Con- struction Ltd.).....	2	16,675.00		
x-Hanmer Twp.	1			+489,947.00
x-Harriston	2	13,486.00		95,367.24
Hawkesbury	2	237,240.00		(additional cost only)
Hespeler	1	5,200.00		
Huntsville	2	81,793.46		
x-Ignace Twp.	1			+146,000.00
Ingersoll	3	147,178.00		

SEWAGE WORKS CERTIFICATES (cont'd)

MUNICIPALITY	No. of Certi- ficates	Extensions to Existing Systems	Treatment and Disposal	New Systems
Kapuskasing	1	206,600.00	100,000.00	
Kemptville	4	18,957.50	30,000.00	
<u>Kemptville</u>				
(Mr. M. Kotlarchuk)..	1	7,000.00		
Kendrey Twp.	1	15,617.00		
Kenora	3	69,244.25		
x-Kincardine	1	1,154.00		
x-Kincardine Twp.	1	+18,500.00		
<u>King Twp.</u>				
(Sky-Line Farms Ltd.)..	1		60,000.00	
Kingston	12	614,834.00		
<u>Kingston</u>				
(Mr. W.A. Killoran)...	1	22,669.37		
(Mr. B.R. Barrett)....	1	6,969.00		
(Homestead Land Hold- ings).....	1	85,000.00		
Kingston Twp.	3	137,210.15		
Kingsville	2	7,124.00		
Kitchener	6	81,708.13		
Korah Twp.	3	222,800.00		
Leamington	4	727,950.00	632,500.00	
Leaside	2	29,007.00		
Lindsay	5	198,211.50		
<u>Lindsay</u>				
(Dominion Rubber Co.)..	1	55,000.00		
Listowel	1	8,034.02		
x-Listowel	2	40,203.93		
x-Little Current	2	+13,655.00		241,650.00
London	22	7,120,552.11	282,000.00	
<u>London</u>				
(Second Upper Thames Development Ltd.)....	1	58,910.00		
(Harry A. Smith Con- struction Ltd.).....	1	112,328.00		
(London Land Syndicate)	1	28,508.00		
(Mr. H. E. Thorne).....	1	35,450.00		
(Mr. M.P. Robinson)....	1	46,450.00		
(Evancraft Ltd.).....	1	18,000.00		
(Pond Mills Properties Ltd.).....	1	65,150.00		
(Oakridge Realty Ltd.)..	1	459,610.00		

SEWAGE WORKS CERTIFICATES (cont'd)

MUNICIPALITY	No. of Certi- ficates	Extensions to Existing Systems	Treatment and Disposal	New Systems
<u>London</u>				
(Mr. S.H. Elgie)....	1	9,177.00		
(Fanshawe Industrial Development).....	1	153,480.00		
(University of Western Ontario).....	2	27,720.00		
<u>Longlac Twp.</u>				
(Kimberly-Clark Pulp & Paper Co.Ltd.)...	1	59,831.00		
Lucan	1	6,870.00		
x-Lucan	1			137,880.00
Lucknow	1	14,605.00		
<u>Lucknow</u>				
(Silverwood Dairies Ltd.).....	1		2,470.00	
 Madoc	1	45,510.00		
<u>March Twp.</u>				
(March Ridge Develop- ment Ltd.).....	1			388,035.00
Markham	3	131,200.00		
Markham Twp.	2	159,066.00		
<u>Markham Twp.</u>				
(Colmur Construction Ltd.).....	1	13,000.00		
Matheson	1	2,520.00		
x-Merrickville	1			+130,000.00
Michipicoten Twp.	1	51,650.00		
Milton	1		+168,000.00	
Mimico	1	9,715.00		
Mitchell	4	57,710.00		
<u>Monaghan North Twp.</u>				
(Suburban District High School Board)...	1		46,110.00	
x-Moore Twp.(P.V. of Corunna).....	1	30,060.00		
<u>Moore Twp.</u>				
(St. Clair-Woods Development Ltd.)...	1	82,500.00		
<u>Morrisburg</u>				
(H.E.P.C.).....	1		142,000.00	
<u>Morrison Twp.</u>				
(Mr. J.H.Bochner)....	1		4,000.00	

SEWAGE WORKS CERTIFICATES (cont'd)

MUNICIPALITY	No. of Certi- ficates	Extensions to Existing Systems	Treatment and Disposal	New Systems
x-Mountjoy Twp.	1			+164,600.00
<u>Muskoka Twp.</u> (Dept. of Public Works of Canada).....1			14,500.00	
Muskoka Hospital (see Gravenhurst)				
Napanee	3	38,888.47		
Nepean Twp.	8	1,029,231.27		
<u>Nepean Twp.</u> (F. & S. Properties Ltd.).....1		83,007.00		
(Wm. Teron Ltd.).....2		31,334.00		
(Campeau Construction Co.Ltd.).....1		47,979.40		
(Minto Construction Ltd.).....1		74,569.00		
New Liskeard	1	4,000.00		
Newmarket	2	7,613.00		
Niagara Falls	8	1,079,139.00		
Niagara Twp.	1	8,818.00		
<u>Niagara Twp.</u> (Jockey Club Ltd.)...2		31,000.00	54,000.00	
Nipigon Twp.	1	8,724.00		
North Bay	2	62,436.30		
x-Norwich	1			+273,500.00
Oakville	13	638,607.90		
Orangeville	2	16,870.00		
x-Orangeville	1		+220,000.00	
<u>Orangeville</u> (Ontario Department of Highways).....1		10,235.00		
Orillia	3	24,023.28		
Orillia Twp.	1	49,473.07		
Oshawa	21	538,677.47		
Ottawa	51	6,180,465.00		
Owen Sound	1	31,480.00		
x-Parry Sound	1			246,455.00 (additional cost only)

SEWAGE WORKS CERTIFICATES (cont'd)

MUNICIPALITY	No. of Certi- ficates	Extensions to Existing Systems	Treatment and Disposal	New Systems
Penetanguishene	3	22,290.00		
Perth	1	18,800.00		
Peterborough	10	315,601.54		
Petrolia	3	9,435.00		
x-Pickering	1			+534,500.00
Pickering Twp.	2	132,532.00		
Picton	1	13,100.00		
Picton (P. E. County)	1	2,400.00		
x-Point Edward	1	+41,250.00		
Port Arthur	7	423,075.50		
<u>Port Arthur</u> (Lakehead Development Limited).....	1	16,500.00		
Port Colborne	3	51,447.35		
x-Port Colborne	3	1,314,860.00		
Port Elgin	1	12,500.00		
Port Hope	1	14,350.00		
Preston	3	114,434.05		
x-Rayside Twp.	1			+489,500.00
Richmond Hill	3	535,700.00		
x-Richmond Hill	1	28,500.00		
<u>Ridgetown</u> (Canadian Cannery Limited).....	1		14,000.00	
x-Rockland	1			405,007.00
<u>Rockland</u> (Mr. Eugene Laviolette)	1	28,950.00		
<u>Romney Twp.</u> (School Area Board)....	1		20,041.00	
St. Catharines	12	2,150,344.00		
<u>St. Catharines</u> (Keistan Estates Ltd.)	2	67,600.00		
(Bradmon Investments Ltd.).....	1	134,256.00		
(Roy Cairns).....	1	3,439.65		
(St. Lawrence Seaway Authorities).....	1		1,400.00	

SEWAGE WORKS CERTIFICATES (cont'd)

MUNICIPALITY	No. of Certi- ficates	Extensions to Existing Systems	Treatment and Disposal	New Systems
St. Marys	2	85,000.00		
St. Thomas	3	120,500.00	390,000.00	
Saltfleet Twp.	2	87,621.00		
x-Saltfleet Twp.	1	+49,968.00		
Sandwich East Twp.	2	219,493.00		
Sandwich West Twp.	3	21,565.45	20,000.00	
Sarnia	12	1,020,600.00		
<u>Sarnia</u>				
(Cabot Carbon of Canada Ltd.).....	1		29,800.00	
(Sarnia Lumber & Builders Supply Co.)	1	29,820.00		
Sault Ste. Marie	7	511,682.00		
Scarborough Twp.	39	2,969,093.85		
Shelburne	1	2,887.11		
Simcoe	1	2,929.00		
<u>Simcoe</u>				
(Gibson & Beckett Con- struction Co.Ltd.)....	1	3,215.00		
Smiths Falls	3	129,000.00	30,000.00	
Smooth Rock Falls	4	52,613.00		
Southwold Twp.				
(School Board).....	1		3,450.00	
Stafford Twp.	1	12,279.20		
Stayner	1			+587,143.00
Stoney Creek	2	19,540.00		
<u>Stoney Creek</u>				
(James Robinson Con- struction Co.Ltd.)....	1	16,710.00		
Stratford	9	274,365.00		
<u>Stratford</u>				
(Oberlander Construc- tion Co.Ltd.).....	1	85,500.00		
Strathroy	1	5,375.00		
Sturgeon Falls	1	12,980.00		
Sudbury	8	1,781,698.00		
<u>Sudbury</u>				
(Thor Investments Sudbury Ltd.).....	1	66,817.00		
(Trend Realty Co. Sudbury Ltd.).....	1	10,174.30		
x-Sutton	2	25,730.00		

SEWAGE WORKS CERTIFICATES (cont'd)

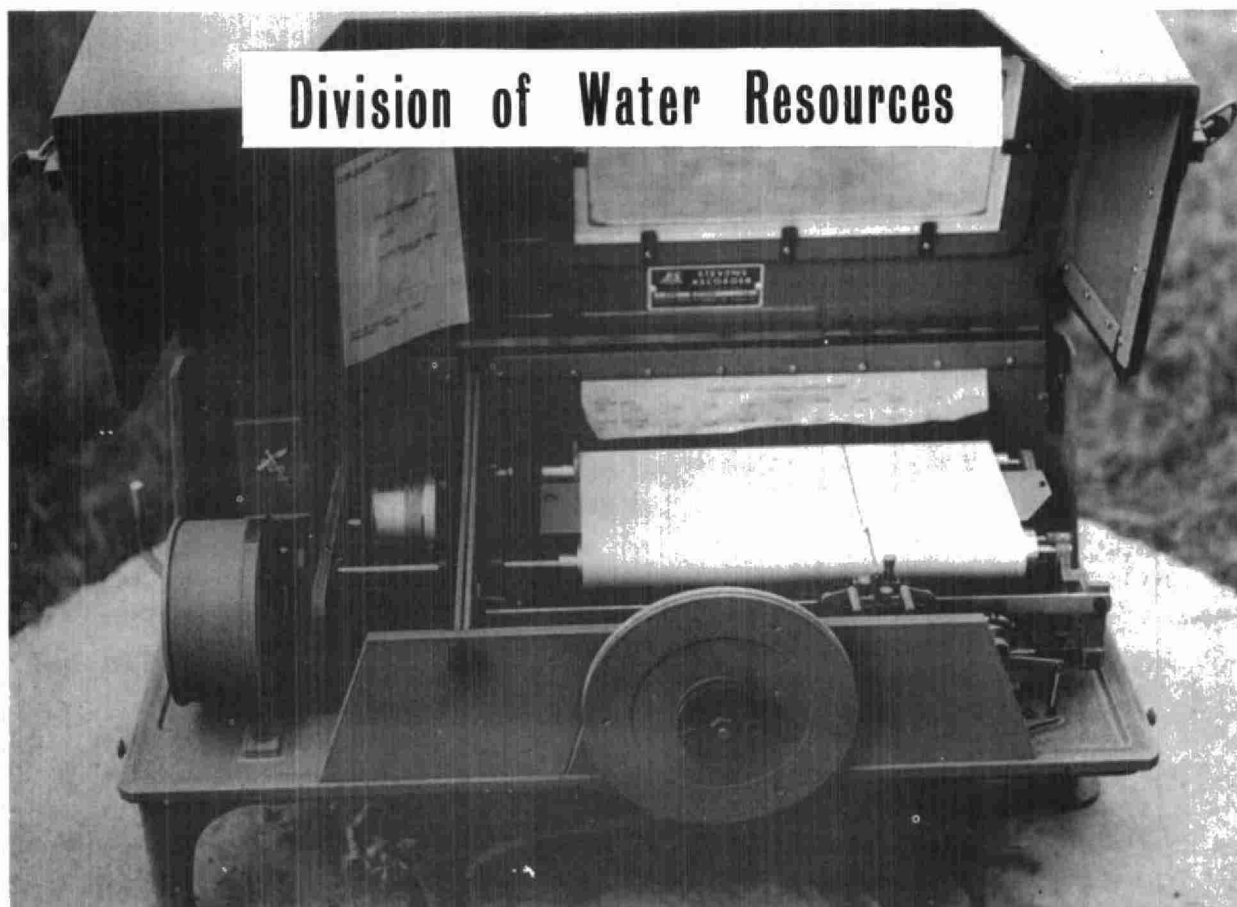
MUNICIPALITY	No. of Certi- ficates	Extensions to Existing Systems	Treatment and Disposal	New Systems
Tarentorus Twp.	6	93,776.60		
x-Tarentorus Twp.	1	+503,100.00		
<u>Tarentorus Twp.</u>				
(Cramall Investments Ltd.).....	1	113,720.00		
(Suburban Developments Ltd.).....	1	28,095.00		
(Hollingsworth Invest- ments Ltd.).....	1	27,590.00		
Thamesville	1	5,563.40		
Thorold	2	18,800.00		
<u>Tilbury East Twp.</u>				
(Supertest Petroleum Corp. and Shell Canada Ltd.).....	1		47,400.00	
Tillsonburg	1	44,385.00		
Timmins	4	338,870.15		
Toronto	29	3,513,461.40		
Toronto Metro	8	1,272,380.00	2,790,000.00	
<u>Toronto Metro</u>				
(Board of Education)..	1	110,000.00		
Toronto Twp.	33	2,711,528.30		
x-Toronto Twp. & Metro				
Toronto.....	1		+1,675,000.00	
<u>Toronto Twp.</u>				
(Edrich Construction Co.Ltd.).....	1	36,146.30		
(Rogerswood Estate)..	1	37,583.56		
(Forest Glen(Dixie) Ltd.).....	2	532,733.72		
Trenton	4	250,220.60		
Tweed	2	7,073.00		
 <u>Usborne Twp.</u>				
(School Board).....	1		18,300.73	
 Vaughan Twp.	4	196,400.00	400,000.00	
<u>Vaughan Twp.</u>				
(Rivermede Developments Limited).....	1	52,840.00		

SEWAGE WORKS CERTIFICATES (cont'd)

MUNICIPALITY	No. of Certi- ficates	Extensions to Existing Systems	Treatment and Disposal	New Systems
Walkerton	1	37,000.00		
Wallaceburg	3	43,800.00		
x-Wallaceburg	1	+2,072,225.00	+510,000.00	
x-Waterdown	1			398,800.00
Waterloo	8	464,840.00		
x-Watford	1			+107,500.00
Welland	8	537,950.84		
Welland	2	+600,000.00	+1,840,000.00	
Weston	1	28,700.00		
Westport	1	14,160.00		
Whitby	1	22,000.00		
<u>Whitney Twp.</u>				
(Ontario Dept. of Public Works).....	1			138,000.00
Widdifield Twp.	2	22,613.60		
<u>Williamsburg Twp.</u>				
(Rohm & Haas(Canada) Ltd.).....	1		34,500.00	
<u>Wilmot Twp.</u>				
(Willo-Dell Golf Club).....	1		1,690.00	
Windsor	2	1,033,500.00		
<u>Windsor</u>				
(Basilian Fathers, Toronto).....	1	10,700.00		
Wingham	3	15,650.00		
Woodbridge	3	18,850.00		
x-Woodbridge	1	+498,500.00		
Woodstock	2	122,573.00		
<u>Woodstock</u>				
(Oberlander Construc- tion Ltd.).....	1	44,800.00		
York Twp.	5	38,000.00		
York East Twp.	4	989,300.00		
York North Twp.	44	4,283,353.71		
TOTALS	941	\$69,715,900.86	\$ 7,005,588.40	\$2,950,840.24

x- OWRC project

+ preliminary approval only - included in total number of certi-
ficates, not included in total
estimates



A. K. Watt, Director
K. E. Symons, Assistant Director

The Division of Water Resources was most active during 1964 in its programs concerned with water management, water resources surveys, hydrologic data and the licensing of water-well contractors. Although most of the programs were faced with an expanded work load over the previous year, the first three, in particular, were quite active and were assigned additional staff.

The number of staff in the division at the end of the year was 43, of whom 15 were professional engineers and geologists and 15 technical assistants. The apportionment of staff by program was as follows:

Administration	6
Water Management	12
Water Resources Surveys	12
Hydrologic Data	8
Licensing of Well Contractors	5

Water Management Program

Interference Problems

There was a marked increase in the number of investigations of water-taking interference during the year, mostly with regard to ground water. In particular, the development of a municipal well for the Town of Brampton at the community of Huttonsville in the Township of Chinguacousy resulted in much time and effort in field investigations, attendance at ratepayers' meetings in an attempt to dispel public fear, and to make satisfactory arrangements for water supply to those whose wells were affected.

Legislation

The water management program was affected by amendments made to the OWRC Act early in the year. Section 28a was amended to simplify the description of well from which the taking of water was to be done under permit; to bring under permit previously exempted water-taking that caused interference with other water uses; and to control ground-water interference caused by construction or excavation projects.

Section 28c was added to provide control over the methods of constructing wells in areas designated by the Commission.

Permits

The number of water permits issued in 1964, including letters of approval for certain short-term takings, were 397. This was considerably less than the previous year but was likely to be closer to the annual number of permits issued in future years. The amount of taking approved by permit was almost half a billion gallons a day. Figure 1 (on page 127) shows graphically the amounts of approved taking since 1961 along with information on source and purpose.

Table 1 (on page 128) contains a summary of the handling of applications and permits during the year. A comparison of permit data for the period 1961-1964 is given in Table 2 (on page 129).

Table 3 (on page 130) gives a summary of the amounts of water-taking approved by permit for various purposes since 1961.

Water Services and Hydrologic Data Programs

There was a considerable increase in the number of ground-water

DIVISION OF WATER RESOURCES WATER MANAGEMENT PROGRAM

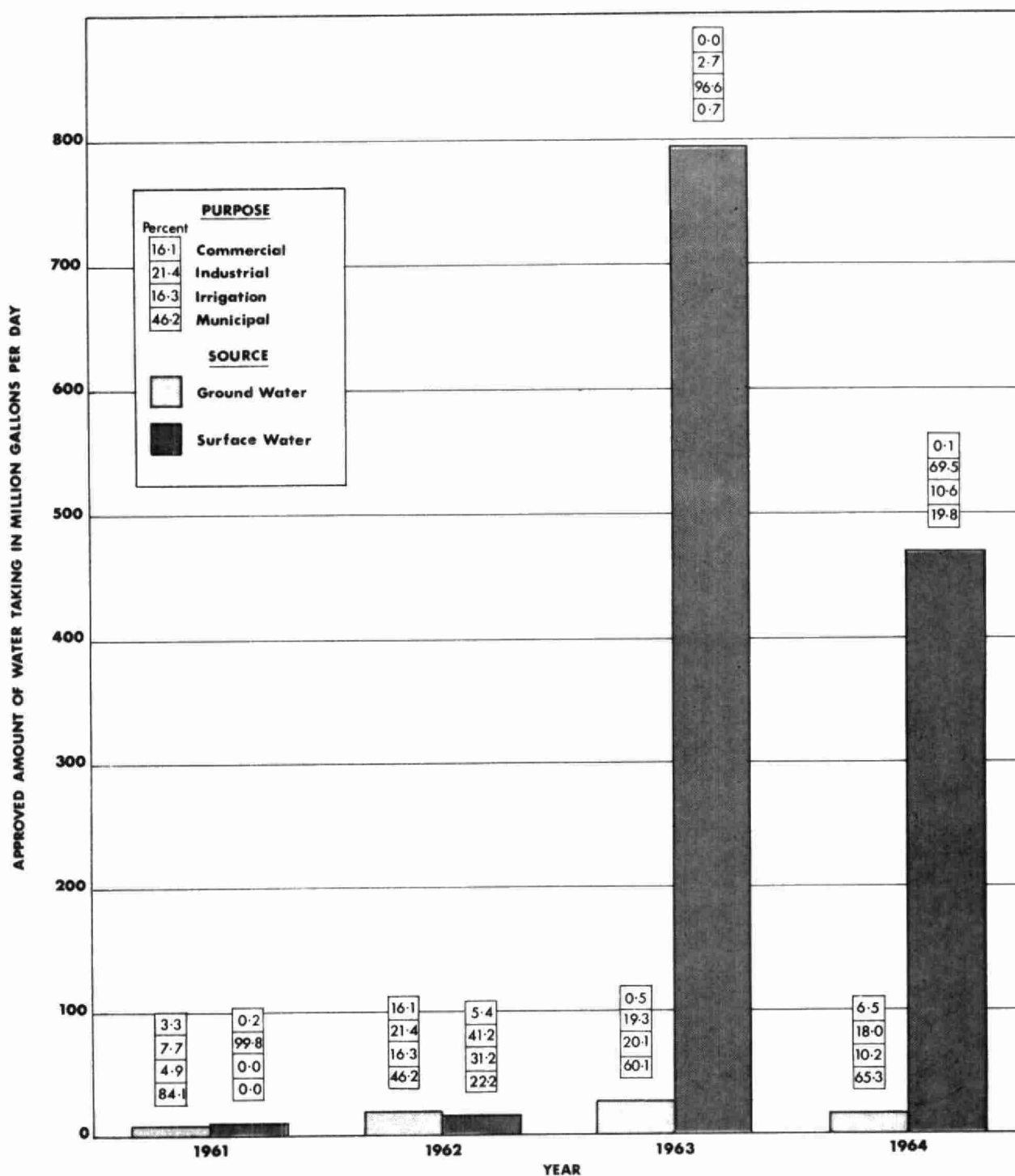


FIGURE 1
AMOUNT OF WATER TAKING APPROVED
ACCORDING TO YEAR, SOURCE AND PURPOSE

TABLE 1. SUMMARY OF WATER PERMIT DATA FOR 1964

SOURCE	APPLICATIONS						AMOUNT OF WATER TAKING APPROVED BY PERMIT (MGD)
	CARRIED FORWARD FROM 1963	RECEIVED IN 1964	REFUSED WITHDRAWN OR NOT REQUIRED	APPROVED		UNDER CONSIDER- ATION ON DEC. 31, 1964	
				BY LETTER	BY PERMIT		
GROUND WATER	41	98	14	24	56	45	16.8
SURFACE WATER	34	418	47	1	316	88	469.2*
GROUND AND SURFACE WATER	2	3	2	-	-	3	-
TOTAL	77	519	63	25	372	136	486.0

* DOES NOT INCLUDE WATER TAKING APPROVED IN 57 PERMITS
WHERE CONDITIONS OF TAKING WERE SPECIFIED RATHER THAN AMOUNT OF TAKING.

TABLE 2. COMPARISON OF PERMIT DATA FOR PERIOD 1961-1964

SOURCE AND PURPOSE OF WATER TAKING	1961		1962		1963		1964	
	No. OF PERMITS ISSUED *	AMOUNT (MGD)	No. OF PERMITS ISSUED *	AMOUNT (MGD)	No. OF PERMITS ISSUED *	AMOUNT (MGD)	No. OF PERMITS ISSUED *	AMOUNT (MGD)
GROUND WATER								
COMMERCIAL	4	0.26	15	3.02	3	0.13	14	1.08
INDUSTRIAL	5	0.60	19	4.01	11	5.15	10	2.98
IRRIGATION	3	0.38	14	3.05	23	5.36	10	1.70
MUNICIPAL	8	6.53	32	8.65	30	16.06	45	10.86
RECREATION	-	-	-	-	-	-	1	0.14
TOTAL	20	7.77	80	18.73	67	26.70	80	16.76
SURFACE WATER								
COMMERCIAL	1	0.02	20	0.86	2	0.23	4	0.40
INDUSTRIAL	6	9.74	7	6.44	14	21.23	27	326.16
IRRIGATION	-	-	21	4.88	2599	767.13	230	49.79
MUNICIPAL	-	-	4	3.48	7	5.18	7	92.76
RECREATION	1	-	17	-	11	0.93	49	0.09
TOTAL	8	9.76	69	15.66	2633	794.70	317	469.20
GROUND AND SUR- FACE COMBINED								
COMMERCIAL	-	-	-	-	-	-	-	-
INDUSTRIAL	-	-	-	-	-	-	-	-
IRRIGATION	-	-	2	0.95	6	1.6	-	-
MUNICIPAL	-	-	1	-	-	-	-	-
RECREATION	-	-	-	-	-	-	-	-
TOTAL	-	-	3	0.95	6	1.6	-	-
GRAND TOTAL	28	17.53	152	35.34	2706	823.0	397	485.96

* INCLUDES LETTERS OF APPROVAL

TABLE 3. SUMMARY OF AMOUNTS OF TAKING APPROVED BY PERMIT FOR VARIOUS PURPOSES SINCE 1961

PURPOSE	1961 MGD	1962 MGD	1963 MGD	1964 MGD	TOTAL APPROVED TAKING 1961-1964 MGD
COMMERCIAL	0.28	3.88	0.36	1.48	6.00
INDUSTRIAL	10.34	10.45	26.38	329.14*	376.31
IRRIGATION	0.38	8.88	774.09	51.49	834.84
MUNICIPAL	6.53	12.13	21.24	103.62	143.52
RECREATION	-	-	0.93	0.23	1.16
TOTAL	17.53	35.34	823.00	485.96	1361.83

* INCLUDES 282.2 MGD FOR NUCLEAR POWER PLANT.

surveys and investigations concerning water supply and waste disposal problems. At the end of the year requests for municipal, ground-water surveys were being scheduled into the fall of 1965.

Both branches were involved in two projects supported by the Agriculture Rehabilitation Development Act. A complete water resources survey of Big Creek, which was initiated in 1963, progressed satisfactorily. The field work was largely completed at the end of the year with most of the work being concentrated on the preparation of maps and the final report. The second project, a synoptic survey involving hydrologic studies in nine drainage basins, commenced in 1964 and was well advanced by the end of the year.

Water levels in 70 observation wells were being assembled by the Ground Water Branch at the end of the year. The Surface Water Branch arranged for the installation of an additional eight streamflow gauging stations, and took close to 1,500 streamflow measurements in its synoptic and regular hydrologic data program. These programs were building up very valuable hydrologic data which were of vital importance in the assessment of Ontario's water resources.

Well Contractor Licensing Program

The number of drilling and boring contractors licenced in 1964 were about the same as in the previous year but the number of well records filed with the division was 8,544 compared to 9,325 in 1963. The geologic and hydrologic information contained in these returns proved extremely valuable to other programs of the division and in dealing with requests for information from other agencies and the general public.

International Hydrologic Decade

A world-wide study of water resources was proposed by UNESCO in 1963. A program was suggested that would proceed for 10 years and involve river basin research, ground-water inventory, preparation of hydrologic maps, and education and training programs. The Province of Ontario agreed to participate in the program which was to commence in April, 1965. The division was represented at several meetings with other government agencies during the year to plan for a co-ordination of effort in the program.

Special Meetings and Activities

The division was represented on a committee which met at

intervals during 1965 to formulate and supervise a program of subsidies for farm ponds, water supply reservoirs and drought stricken areas. It also participated in the planning of the Prime Minister's Conference on Lake Levels which took place in June and in other meetings pertaining to Great Lakes studies.

Hearings were attended at Brantford, Chatham, Parkhill and Sarnia with respect to the need for pipe-line water. Ground-water availability maps were prepared for use at these meetings as background information on ground-water conditions in the areas concerned.

Division personnel gave 14 addresses in 1964, participated in three television and panel discussions, and attended 15 technical conferences.

GROUND WATER BRANCH

The Ground Water Branch was active in four major programs: water management, water resources surveys, hydrologic data and well contractor licensing. By means of these programs, data, advice and protection were made available throughout the province to individuals, corporations, municipalities and provincial departments. The number of surveys and investigations in the water management and water resources surveys programs increased by 44 per cent, the gathering of hydrologic data was intensified, and the level of activity in the licensing of well contractors was maintained.

Activities of the branch in detail:

Water Management Program

The processing of permits to take water and the investigation of well interference problems constituted the major part of the duties carried out under the water management program.

Water Permits

The number of permits issued for the taking of water during 1964 was less than during 1963, but the number of letters of approval issued for short-term pumping tests increased sharply. Fifty-six permits were issued for the taking of 16.8 million gallons of water per day, and 24 short-term takings were approved by letter. Of the 98 applications received, 14 did not require a permit. Forty-five applications were under consideration at the end of the year. Many of the applications under consideration

were incomplete and required additional information before they could be processed.

Ground-Water Interference Investigations

Fifty-three investigations of ground-water interference problems were made and reports were completed for 26 problems during the year. A number of the investigations necessitated frequent field trips in order to obtain sufficient information.

The number of investigations carried out in the various municipalities are indicated below:

Townships of Blanshard and Nissouri East (1),
Brantford (3), Chinguacousy (12), Cumberland (2),
Dorchester North (1), Delaware (4), Esquesing (1),
Guelph (1), Lobo, (1), Macaulay (1), Malden (1),
Mariposa (1), Markham (2), Matilda (1),
Pickering (1), Puslinch (2), Rolph (1), Scarborough (1),
Thurlow (1), Toronto (1), Vaughan (1),
Waterloo (3), Wawanosh East (1), Westminster (3),
Yarmouth (1), Zorra West (1);

Village of Stouffville (1);

Towns of Orangeville (1) and Preston (1);

City of London (1).

The more comprehensive well-interference studies were made in the following municipalities:

Township of Brantford: Wyndham Hills Area
Township of Chinguacousy: Brampton - Heart Lake Area and
Brampton - Huttonsville Area
Townships of Delaware and Lobo: London - Komoka Area
Township of Puslinch: Guelph-Stone and Carter Area
Township of Westminster: London-White Oak Area

Township of Brantford - Following the 1963 survey of well interference in the Wyndham Hills area, four man-days were spent in the area checking on claims for compensation resulting from the operation of wells by the City of Brantford and the Township of Brantford. Seven claims for compensation in the total amount of \$2,580.90 were settled jointly by the two municipalities.

Township of Chinguacousy - Six man-days were spent in the

Heart Lake area in connection with a survey of well interference due to the operation of the Brampton municipal wells. Twenty-six residents were visited, 11 complained of interference and seven were recommended for compensation. Three of the latter had been resolved satisfactorily at the end of the year, two by obtaining water service from the Brampton watermain and one by receiving compensation in the amount of \$481.34.

Ninety-four man-days were spent in the Huttonsville area during the year conducting two comprehensive surveys in connection with Brampton pumping tests. Information was obtained for 331 wells. Twelve wells were believed to have been affected by the pumping tests and water was delivered by Brampton to six wells during the tests. One well was deepened by Brampton.

Townships of Delaware and Lobo - Four man-days were spent investigating four claims of interference with the water supplies of rural residents attributed to the operation of the London-Komoka municipal wells. Three of the claims were considered unjustified and the remaining claimant was compensated in the amount of \$503.80.

Township of Puslinch - As a result of a survey of well interference carried out in the Guelph - Stone and Carter municipal wells area in 1963, four residents received compensation or had their water supplies restored in 1964. Three other claims were not settled pending the supplying of additional information by the claimants.

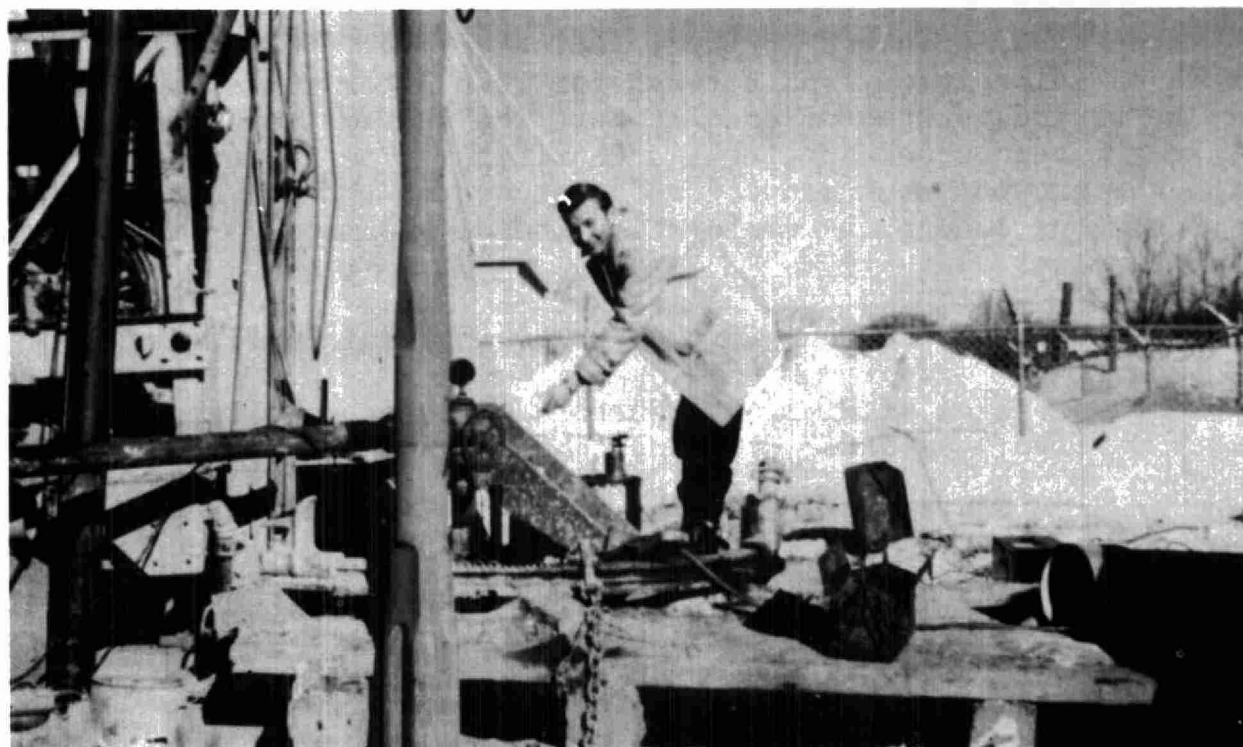
Township of Westminster - A well-interference survey initiated in 1963 as a result of the operation of the London-White Oak municipal wells was continued in 1964. Twenty-nine man-days were spent investigating 12 complaints and gathering information regarding ground-water conditions in the area. During the year, one claim was rejected, and six residents were paid a total of \$5,537.80 by the London PUC acting on the recommendations of the OWRC.

The total amount of compensation paid in 1964 to the owners of wells seriously affected by the operation of municipal wells in the above areas was \$9,103.84.

Six requests for investigations of well-interference problems received from the Department of Highways, Ontario, formed a significant part of the water management program.

Water Resources Surveys Program

Water resources surveys and investigations were undertaken at the request of municipal, provincial and federal authorities, individuals and the Commission. Four geologists and two assistants were engaged in this work at the end of the year. Work completed or in progress included 19 municipal hydrogeologic surveys, 10 test-drilling and well-construction projects and 37 special investigations relating to water-supply and waste-disposal problems. The ground-water sections of three county water resources survey reports were completed, the text for a fourth was finished with the maps under preparation, and the text of a county survey report submitted in 1963 received final editing. Work was in progress on a township survey, a study of the hydrogeology of the Woodbridge area and a thorough evaluation of the ground-water resources of the Big Creek drainage basin. The work carried out in this program is represented in Figure 2, (on page 141).



River Basin Surveys

The collection of hydrogeologic data for the water resources survey of the Big Creek drainage basin was carried on throughout the year. By the end of the year, maps representing this information were at an advanced stage of preparation and much of the data had been assembled for use in preparing the text of the report. The survey was carried out with the support of the Agriculture Rehabilitation Development Act program.

County and Township Surveys

The final editing of the report on the water resources survey of the County of Norfolk and the ground-water contributions to the reports for the counties of Brant, Frontenac and Welland were completed. The text of the ground-water section of the County of Halton report was completed, and the preparation of maps was in progress.

Field work was completed for the evaluation of the water resources in portions of the townships of Etobicoke, North York, and Vaughan as part of a co-operative mapping project being carried out in the Woodbridge area with other government agencies. The National Research Council supported the drilling of two test holes to help determine the engineering, geologic and hydrologic conditions of the overburden. Revisions were made to the text of the water resources survey report for the Township of Zorra East.

Municipal Hydrogeologic Surveys

Reports were issued for hydrogeologic surveys carried out for 14 municipalities, and surveys for five other municipalities were at various stages of completion. The surveys were carried out at the request of the local authorities. The reports set forth the ground-water conditions of each area and contained recommendations concerning exploration and development for municipal water supplies.

The surveys were done for the following municipalities:

Townships of Himsworth North, Jaffray and Melick,
Oliver, Rayside, Richmond, Shuniah and Whitby East;

Police Village of Noelville;

Villages of Alvinston, Belmont, Glencoe, Port Burwell
and Thamesville;

Towns of Durham, Fergus, Seaforth and Trenton;

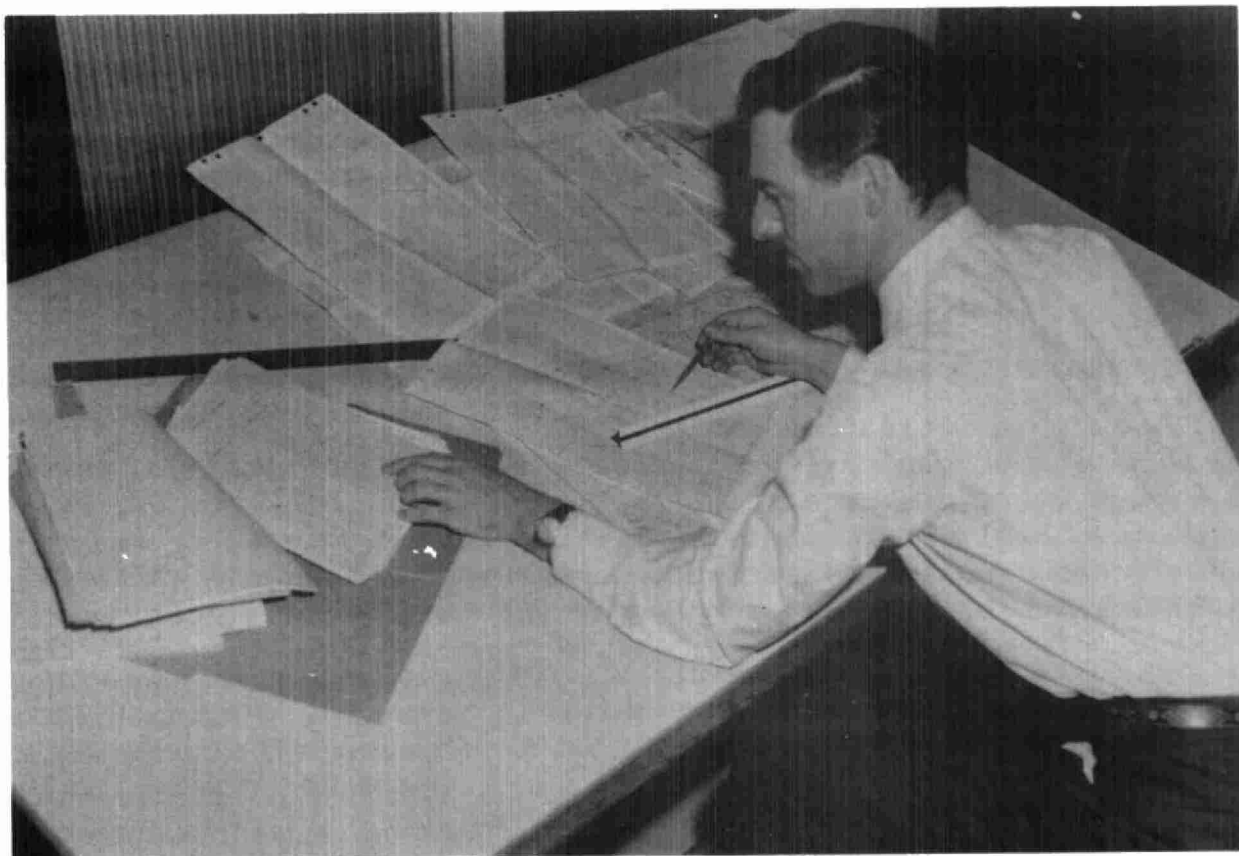
Cities of Kitchener and Sudbury.

Test Drilling and Well Construction Projects

The branch was active in eight test-drilling and two well-construction projects during the year. This work was an extension of municipal hydrogeologic surveys to testing, design and

construction stages and was carried out under agreements between the Commission and the municipalities. Reports were issued for five of the six test-drilling projects completed during the year, and contract documents were being prepared for two test-drilling and two well-construction projects.

Test-drilling projects continued from 1963 for the townships of Chapleau and Emo; villages of Bobcaygeon and Havelock, and the towns of Midland and Vankleek Hill.



The work at Chapleau, Emo and Bobcaygeon failed to locate adequate supplies. Satisfactory well sites were found at Midland, and Vankleek Hill, and encouraging results were obtained at Havelock. Production wells were completed as an integral part of the Havelock and Vankleek Hill test-drilling programs.

Test-drilling projects initiated or resumed during 1964 were for the villages of Plantagenet and Winchester; and for well construction in the Township of Clarke (Police Village of Orono), and the Town of Brampton.

Tenders were opened for well construction at Orono and tender documents were being prepared for the work at Plantagenet, Winchester and Brampton.

Special Investigations

Reports were completed for 28 special investigations related to water-supply and waste-disposal problems. Field work was completed for eight more problems and was in progress for one. The work was carried out at the request of municipal, provincial and federal authorities; provincial government departments and the Commission.

Three investigations involved water supplies for the Department of Lands and Forests at Darlington Provincial Park, Presqu'ile Provincial Park and the Tweed area. Ground-water conditions were reviewed for a school in the Town of Oakville.

Investigations of well, spring and local ground-water problems were made for eight municipalities: the Township of King; the villages of Alfred, Havelock, Port Perry, Stouffville and Wellington; the Town of Caledonia and the City of Guelph. Five well-contamination problems were studied in the townships of Anderdon, Dunn, Huntingdon, Malden, Richmond and Seymore.

Twenty investigations were made to evaluate the effect of the disposal of sanitary and industrial wastes on local and regional ground-water resources, in the townships of Chinguacousy, Erin, Esquesing, Gwillimbury East, King, Nassagaweya, Otonabee, Plantagenet South, Puslinch, Saltfleet, Scarborough, Vaughan, Whitby East, Whitchurch, Windham and Woodhouse; the Town of Burlington and the City of Sarnia.

Hydrologic Data Program

The collection and assembly of basic hydrologic data in the branch were maintained through the submission of water-well records by drilling and boring contractors, the preparation of bulletins dealing with ground-water conditions in the Province, an observation well program, the preparation of ground-water availability maps, and a newly-instituted synoptic surveys program. The hydrologic data program, in operation since 1946, resulted in the accumulation of valuable information relating to geologic and ground-water conditions throughout Ontario. The assembly for publication of hydrologic data was completed for 1958 and was started for 1959. Once published the data were available to the public as ground-water bulletins.

A field examination was made of a proposed research drainage basin in the Stayner area and discussions were held among representatives of the divisions of Research and Water Resources concerning other potential areas in the Province for the setting up

of research and experimental basins.

Observation Wells

Water levels in 70 wells were being measured at the end of 1964. Automatic recorders were in use in 22 wells, steel tapes in 45 wells and airline devices in three wells. A graphic representation of the total number of observation wells and those equipped with automatic recorders from 1951 to 1964 is given in Figure 3 (on page 142).

Observation-well data were collected in certain areas because of special water problems. The taking of water-level measurements was continued in the vicinities of the Komoka and White Oak well fields in the townships of Lobo, Delaware and Westminster. An automatic recorder was installed on a privately-owned well in the Township of Westminster in an attempt to resolve a complaint of well interference.

Observations were continued on several wells at the site of the proposed Pittock Dam near the City of Woodstock and, in addition, measurements were commenced in six privately owned wells near the proposed damsite to provide additional information on the effect of the dam and reservoir on ground-water levels. Observations were continued on the well near the site of the Wildwood Dam in the Township of Downie.

A water-level recorder was installed on a test well in the Town of Midland to determine water-level fluctuations in the aquifer under non-pumping conditions. Another recorder was installed on a short-term basis for measuring water-level interference during pumping tests carried out for the town.

Hydrographs were prepared for wells operated by the Commission at Brooklin, Chesterville, Frankford, Newcastle, Sunderland, Wellington and Winchester. Arrangements were made with the Moira River Conservation Authority for the future installation of two automatic recorders on authority wells and for the measuring of at least six other wells with tapes. Precipitation data were reassembled to be more readily available for reference purposes.

Synoptic Surveys

A synoptic survey was commenced in March in conjunction with the Surface Water Branch to determine the relation of streamflow to other hydrologic factors and aid in planning an improved streamflow gauging network. The Ground Water Branch undertook reconnaissance geologic studies and representative well water

measurements in the Ganaraska River, Bronte Creek, Twenty-Mile Creek, Lynn River, Big Otter Creek, Sydenham River, South Nation River, Holland River and Coldwater River drainage basins. By the end of the year, base maps had been prepared showing drainage basin boundaries, observation well locations, and general surficial geology

Ground Water Availability Maps

A map showing a generalized evaluation of ground-water conditions in southern Ontario with reference to municipal requirements was prepared. Maps were also prepared showing preliminary evaluations of ground-water conditions in the townships of Harwich and Raleigh in the County of Kent, along the proposed route of the Lake Huron Water Supply System, and in the Brigden area of the County of Lambton. Preliminary evaluations of ground-water conditions were started for the County of Essex and the proposed route of the Jarvis-to-Brantford pipeline.

Well Contractor Licensing Program

Four hundred and twelve licences were issued in 1964 for carrying on the business of boring or drilling wells for water. Nineteen of the licences were held by boring contractors and the remainder by drilling contractors. Records for 8,544 wells were forwarded to the branch by the contractors during the year. Total records received annually between 1951 and 1964 are shown in Figure 4, (on page 142). The three inspectors visited the contractors on 1,014 occasions and made 8,145 checks on the locations of wells and 937 checks for sanitary well construction.

Meetings with representatives of the Canadian Water Well Contractors Association were held to review the legislation relating to the construction of wells. The meetings were to be continued in 1965.

A driller was asked to appear at the office of the Ground Water Branch to discuss his well-construction practices in the counties of Eglin and Kent. He was required to effect improvements in certain of the wells.

The Commission authorized the laying of charges against one drilling contractor for drilling without a licence and against another for installing used casing of insufficient length to prevent the contamination of ground water and for failing to seal properly the upper open end of the casing. The charges had not been laid by the end of the year. A charge of installing used

DIVISION OF WATER RESOURCES
GROUND WATER BRANCH

WATER MANAGEMENT AND SURVEY PROGRAMS

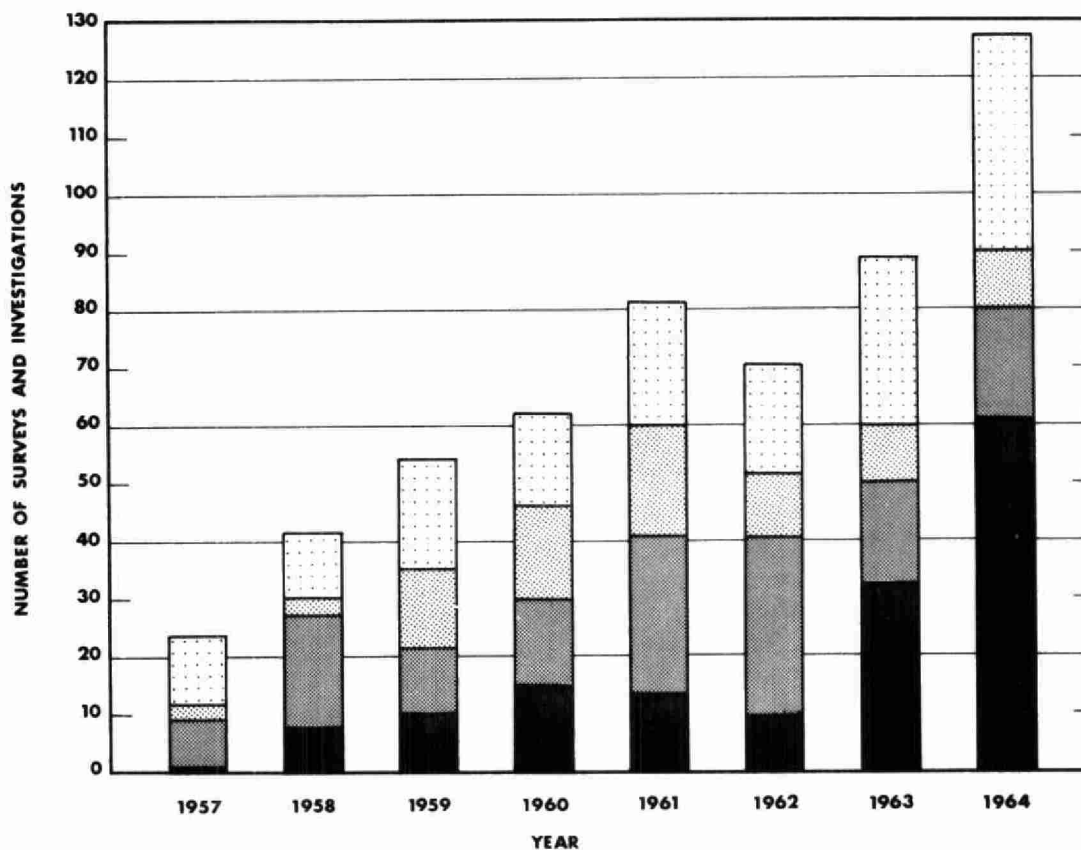
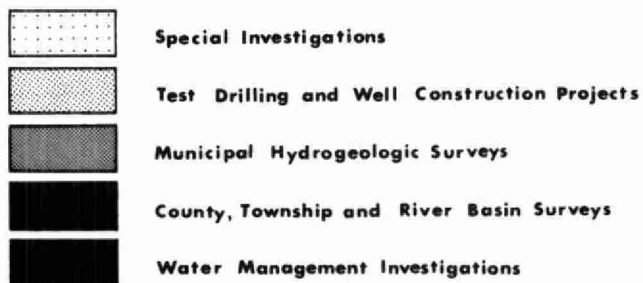


FIGURE 2

TYPES OF SURVEYS AND INVESTIGATIONS



DIVISION OF WATER RESOURCES
GROUND WATER BRANCH
HYDROLOGIC DATA PROGRAM

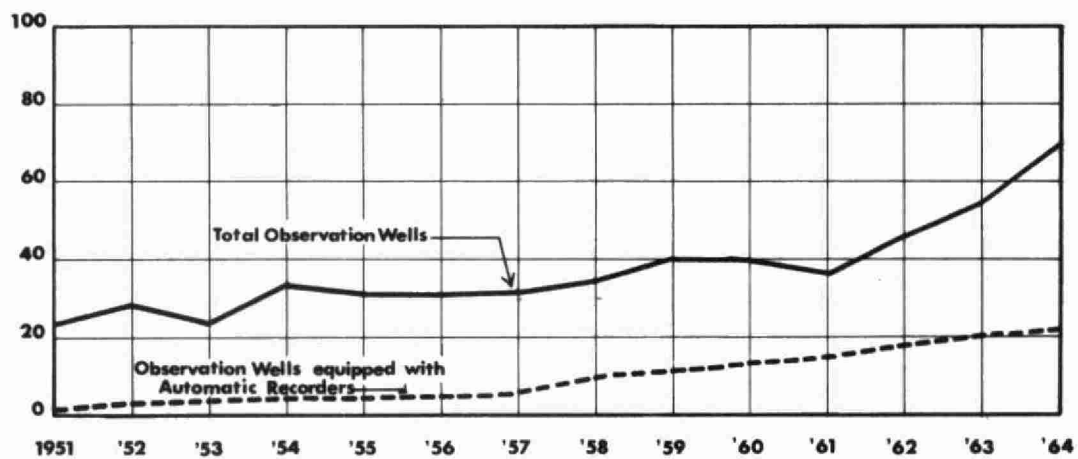


FIGURE 3
NUMBER OF OBSERVATION WELLS

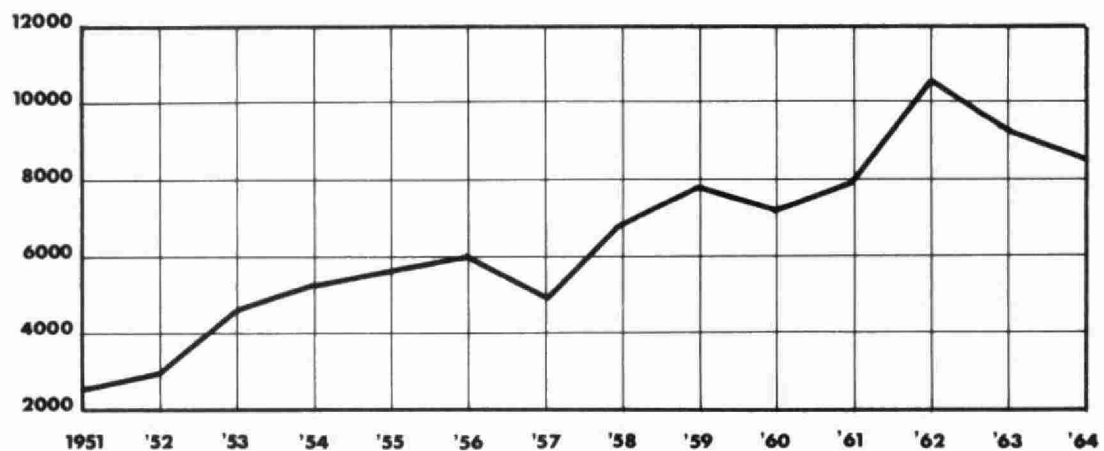


FIGURE 4
NUMBER OF WATER WELL RECORDS RECEIVED ANNUALLY

casing laid against a drilling contractor during 1963 was withdrawn in 1964 because of doubt whether the information had been laid within the proper time limitation.

Other Activities

Discussions concerning municipal ground-water supplies were held with representatives of the Police Village of Brigden, the villages of Grand Bend and Stouffville, the towns of Forest and Richmond Hill, and the City of Brantford.

Ground-water conditions were outlined for many rural and suburban residents in response to verbal and written inquiries. By means of this service many persons were helped to obtain improved water supplies.

SURFACE WATER BRANCH

The work of the Surface Water Branch was carried forward under three main programs, water management, water resources surveys and hydrologic data. A majority of staff continued to function in the water management program dealing with applications and permits to take water and interference problems. In the survey program, contributions were made to four county survey reports and there was extensive participation in one drainage basin survey. To provide and improve hydrologic data eight streamflow-gauging stations were established and hydrometric measurements were made and analyzed in the synoptic survey project. In all programs, close co-operation was maintained with the Ground Water Branch and other divisions.

Water Management Program

Expansion of activities in the water management program took the form of increased intensity rather than numerical increases in the various operations. In comparison with 1963, the numbers of applications and permits for taking water from surface sources was less and the number of complaints requiring field investigation was about the same.

Summer students again were employed in inspection and enforcement assignments. About 660 farms were visited in the counties of Durham, Northumberland, Kent, and Essex to acquaint irrigators with the requirements of the legislation.

Water Permits

A total of 452 applications for permits to take water from

surface sources was reviewed during the year. Of these, 34 were carried forward from 1963 and 418 were received during the year. Forty-seven applications were either withdrawn by the applicant or determined to be for takings not subject to authorization by permit. One taking was authorized by letter of approval and 316 by permit. At the end of the year, 88 applications were under active consideration or were being held in abeyance pending the submission of requested information by the applicant.

In addition, five applications were reviewed for takings from combined ground and surface water sources. One was withdrawn from files following two years of unanswered correspondence and one was for a taking not subject to authorization by permit. Three remained on file awaiting further information from applicants.

Most of the applications were for irrigation of farm crops or golf courses. This reflected the results of visits to farms and form letters to golf clubs. The provincial farm pond subsidy program and liason with agricultural representatives and extension engineers of the Department of Agriculture resulted in many applications for permits to take water into storage and enquiries concerning water use regulation.

Surface Water Interference Investigation

Thirty-nine complaints concerning interference with surface-water supplies or depletion of streamflow were received which required field investigation. Many others were dealt with through office procedures.

Fewer complaints were received in 1964 concerning interference caused by irrigation of farm crops. This could be attributed to an increased consciousness of water management and to the pattern of precipitation during the growing season. The number of complaints prompted by the filling of small on-stream ponds increased. Many of these ponds were constructed for livestock watering and the takings of water into storage were therefore exempt from control by permit. An increasing number of complaints were based on concern about depreciation of aesthetic and recreational values resulting from depletion of streamflow. In most instances remedial measures were taken promptly.

A watch was kept on areas where problems had been encountered in previous years. In two instances, streamflow gauging stations were established to monitor flow conditions.

Water Resources Surveys Program

The branch was active in two types of water resources surveys, county surveys in co-operation with a number of divisions, and river basin surveys as a division activity with federal and provincial financial support through Agriculture Rehabilitation Development Act agencies. Contributions were made to four county survey reports. Intensive studies were made of water resources, their development and uses in the Big Creek Drainage Basin.

Staff was expanded in May to include two engineers, one engineer's assistant and one summer student.

River Basin Surveys

The branch participated actively in the Big Creek drainage basin survey and concentrated on surface water aspects of the survey designed to improve knowledge and use of water resources in this predominantly agricultural area. Field work was completed, assembly and analysis of data were progressing and maps and sections of the report were in various stages of completion at the end of the year.

The area had experienced conflicts over available water supplies arising from extensive use of water for irrigation of tobacco crops. Inventories of water resources and use were prepared and hydrologic data and functions were examined to help in estimating a water budget and to promote efficient use and development of the water resources of the area. Specific studies were made of topography, precipitation, infiltration, run-off, evapotranspiration, and water quality. Surveys were made of farm ponds, dams and reservoirs, types and acreages of crops, adequacy of water supplies, and future water requirements through visits to individual farms. Data available through the water management program were utilized. Potential reservoir sites were reviewed.

Two automatic-recording water-level gauges were installed and operated by the branch to augment streamflow data available from the Department of Northern Affairs and National Resources.

Excellent co-operation was received from government agencies and other organizations who were asked to make some contribution of information or service in this program.



County Surveys

The branch co-operated in the preparation of water resources survey reports for the counties of Welland, Brant, Frontenac and Halton. Sections dealing with surface water resources which included hydrometric data, water use, drainage, legislation and conservation were prepared for the reports.

Hydrologic Data Program

To obtain basic hydrologic data and to improve understanding of hydrologic processes, the branch sponsored the installation of eight permanent streamflow gauging stations in southern Ontario, made direct measurement of streamflows and analyzed streamflow data. Some of this was carried forward in the synoptic survey. Hydrometric data were obtained and analyzed for a number of specific studies. These involved Lake Erie, the Great Lakes, Mattagami River, Humber River, and St. Clair River.

During the year the regular staff was expanded to include one engineer and two engineer's assistants.

Streamflow Gauging Stations

In a co-operative program with the Department of Northern Affairs and National Resources eight streamflow gauging stations were installed during the year to bring those in co-operative operation to a total of 18.



The stations installed this year are tabulated below according to location and type of gauge.

Streamflow Gauging Stations Installed in 1964

<u>Drainage Basin</u>	<u>Stream</u>	<u>Location</u>	<u>Type of Gauge</u>
Big Otter Creek	Big Otter Creek	above Otterville	Recorder
Black Creek	Black Creek	at Baldwin	Recorder
Catfish Creek	Catfish Creek	near Sparta	Recorder
Grand River	Mount Pleasant	near Burtch	Manual
Nottawasaga River	tributary	near Stayner	Recorder
Oakville Creek	East Br. Oak- ville Creek	at Omagh	Recorder*

<u>Drainage Basin</u>	<u>Stream</u>	<u>Location</u>	<u>Type of Gauge</u>
South Otter Creek	South Otter Creek	near Port Burwell	Recorder
Thames River	Avon River	below Stratford	Recorder

* Conversion of manual station

In addition, two stations with recording equipment were installed on Big Creek as part of the river basin survey. These were near Harley and Port Rowan. Two temporary stations were installed under the water management program, one on Bogart Creek, a tributary of the Holland River, and one on a small tributary of the West Branch of Duffin Creek. For calibration purposes, weirs were installed or rating curves were established from repeated metering of flows under various flow conditions.

Two meetings were held in the offices of the Ontario Water Resources Commission at the request of the Water Resources Branch, Department of Northern Affairs and National Resources, to review the adequacy of the network of streamflow gauging stations in Ontario and to co-ordinate streamflow measurement programs. Representatives of the following agencies attended: Conservation Authorities Branch, Ontario Department of Energy and Resources Management; The Ontario Hydro-Electric Power Commission of Ontario; Ontario Department of Public Works; Ontario Department of Lands and Forests; and Department of Transport (Canada). It was concluded that considerable expansion of the network was needed to improve low flow and small stream data although some economies might be achieved through correlation procedures.

Streamflow Measurement

The program of metering streamflows was reorganized with the bulk of the work being carried forward under the synoptic survey. The objectives of the survey included expansion of hydro-metric data and understanding of hydrologic relationships and assessment of the existing network of streamflow gauging stations. Nine areas including 30 streams or parts of streams were selected for study. Some 349 stations for measurement were chosen and 1,347 flow measurements were made during the year. The distribution of streamflow measurements is tabulated below.

Distribution of Synoptic Survey Streamflow Measurements
by Area and Stream

<u>Area and Stream</u>	<u>No. of Measurements</u>	<u>Area and Stream</u>	<u>No. of Measurements</u>
Ganaraska		Twenty Mile	
Ganaraska River	108	Twenty Mile Creek	48
Cobourg Brook	44	Welland River	30
Gage Creek	16	Forty Mile Creek	20
Graham Creek	22		
Lynn		Holland	
Lynn River	57	Holland River	86
Black Creek	36	Schomberg River	34
Nanticoke Creek	52	Black River	62
Young Creek	24		
Bronte		Sydenham	
Bronte Creek	99	Bear Creek	52
Grindstone Creek	16	Black Creek	20
Oakville Creek	51	Brown Creek	26
Otter		Coldwater	
Big Otter Creek	105	Coldwater River	60
Catfish Creek	60	Sturgeon River	25
Little Otter Creek	22	North River	41
South Otter Creek	16		
		South Nation	
		Castor River	44
		South Nation River	34
		Scotch River	37

Towards the end of the year data were being analyzed to establish, if possible, relationships between streamflow and such factors as precipitation, ground water, drainage area, length of stream and type of surface soil. Mapping of data was proceeding for analysis and reporting purposes.

In addition, 174 streamflow measurements or observations were made for specific purposes on 25 streams. Of these, 20 were made on Etobicoke Creek, 10 on Four Mile Creek, 30 on the Humber River and 39 on the Rouge River.

Summary of Streamflow Measurement Program

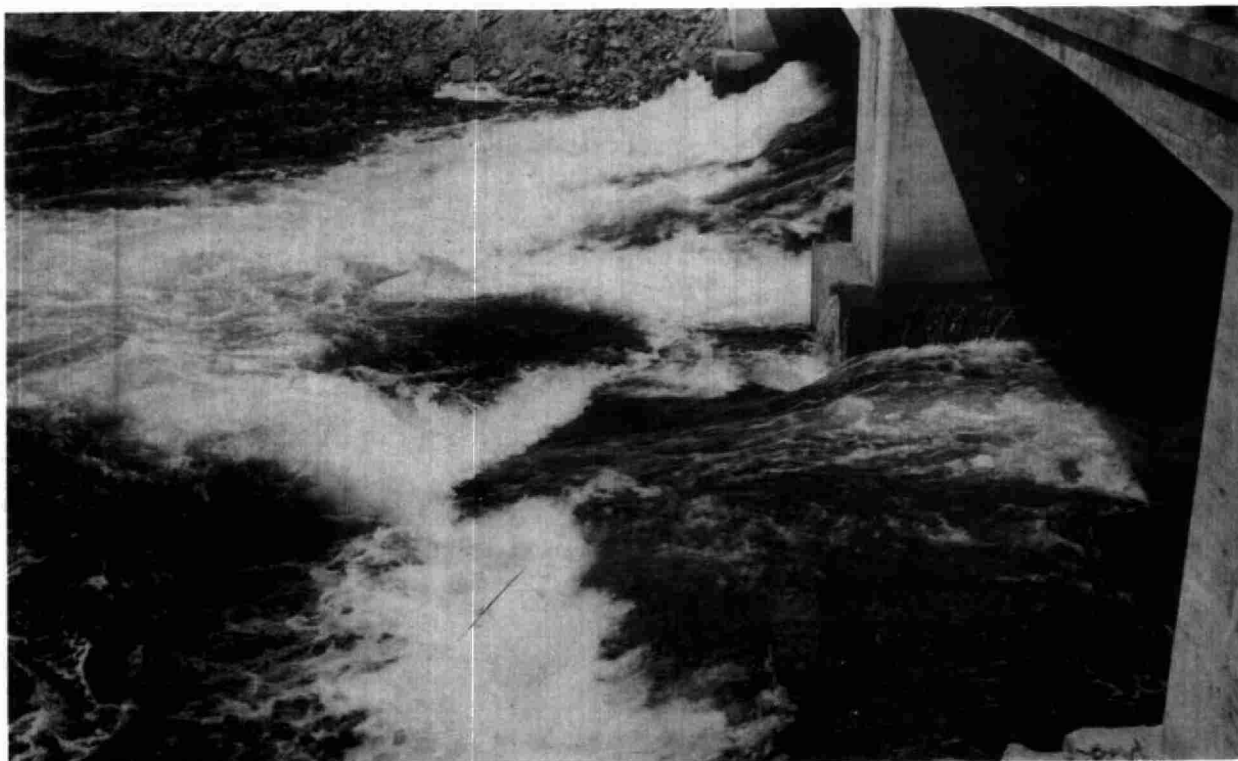
<u>Year</u>	<u>Number of Stations</u>	<u>Number of Flow Measurements</u>
1962	553	440
1963	1,554	1,976
1964	509	1,498

Other Activities

Discussions were held with representatives of the Department of Lands and Forests and of the Division of Research concerning small research-watershed projects. A site near Stayner was examined in the field and a streamflow gauging station was installed.

Staff of the branch participated in the preparation of material for special meetings. For example, data were prepared on the hydrology of the Great Lakes and on dams and reservoirs in the area of Metropolitan Toronto and Region Conservation Authority.

Most of the technical staff of the branch attended one of the two courses on streamflow measurement given by staff of the Ontario District Office, Water Resources Branch, Department of Northern Affairs and National Resources.



OWRC - MUNICIPAL PROJECTS

Here is a complete list of OWRC-municipal projects as at
December 31, 1964

- * - in partial operation (TD) test drilling
 ** - in operation * OWRC/CMHC project
 -0- - pending test drilling x Municipal Development & Loan Board/
 results OWRC project
 A - actual cost(others estimates)

(S2) second sewage project for municipality
 (W2) second water project for municipality

Project Number	Municipality	Cost Estimate	Project Number	Municipality	Cost Estimate
57-S-1	A Toronto Twp.	502,440(F)**	59-S-37	A Hespeler	17,429(F)**
2	A Stratford	925,309(F)**	38	A Trafalgar Twp.	
3	A Bancroft	114,633(F)**		(now Oakville)	253,357(F)**
4	A Trenton	515,665(F)**	39	Fort Erie *	646,000(F)**
5	A Streetsville	310,938(F)**	40	A Markham Vill.	608,711(F)**
6	A Richmond Hill	359,420(F)**	41	Sudbury(McKim)	605,779(F)**
7	A Korah Twp.	44,309(F)**	42	A Korah Twp.(S2)	113,537(F)**
8	A Coniston	468,190(F)**	43	Metro Toronto/ Twp. of Tor.*	1,876,941(F)**
9	A Frankford	162,062(F)**	44	Tarentorus	134,258(F)**
58-S-10	North Bay Area	2,372,976(F)**	45	Kenora	88,100(P)
11	A Brantford	2,250,956(F)**	46	A Preston *	147,618(F)**
12	Tillsonburg	609,793(F)**	47	A Port Colborne	625,008(F)**
13	A Port Arthur	2,191,147(F)**	48	A Leamington(S2)	55,780(F)**
14	Brampton/ Chinguacousy	997,201(F)**	60-S-49	A Winchester	93,527(F)**
	Brampton/ Ching. Ext.	389,140(F)**	50	Ft. William & Ext. *	1,560,000(F)**
15	Huntsville	474,310(F)**	51	A Burlington(S2)	676,034(F)**
16	Orangeville	180,453(F)**	52	Galt (S2)	167,076(F)**
17	A Georgetown	871,677(F)**	53	Sudbury(S2)*	1,800,000(F)**
18	A Stirling & Ext.	258,992(F)**	54	Bracebridge*	421,274(F)**
19	A Kitchener	1,312,746(F)**	55	Markham Vill. (S2)	262,262(F)**
	Kitchener(S2)*	1,681,410(F)**	56	A New Hamburg & Ext. *	465,281(F)**
20	S.S.Marie Area	3,296,726(F)**	57	Cornwall (Engineering)	175,000(F)
21	A Wiarton	130,601(F)**	58	A Chelmsford	310,136(F)**
22	A Waterloo	728,676(F)**		Chelmsford Ext.	44,452(F)**
23	A Fergus	277,393(F)**	59	A Fort Frances *	1,956,615(F)**
24	Marmora *	30,460(F)**	60	A Seaforth	224,555(F)**
25	Listowel	522,237(F)**	61	A Grimsby	111,889(F)**
26	Leamington	95,510(F)**	62	Bradford *	282,125(F)**
27	A London Twp.	923,648(F)**	63	Playfair Twp. (Ramore) *	60,251(F)**
28	A Burlington	382,773(F)**	64	A Coniston (S2)	24,949(F)**
59-S-29	Mitchell (San)*	302,933(F)**	65	Neelon & Garson*	722,000(F)**
30	A Galt	246,909(F)**	66	A Brampton (S2)	119,950(F)**
31	A Barrie	297,263(F)**	67	Listowel (S2)	62,699(F)**
32	A Stratford (S2)	84,431(F)**	68	Owen Sound	742,580(F)**
33	A Westminster	270,727(F)**			
34	Paris *	825,000(F)**			
35	Nepean Twp.	1,477,573(F)**			
36	A Point Edward	849,780(F)**			

Project Number	Municipality	Cost Estimate	Project Number	Municipality	Cost Estimate
60-S-68	A Owen Sound Ext.	485,196(F)**	62-S-109	Chesley *	268,280(F)**
69	Owen Sound(San)	1,622,830(F)**	110	A Kincardine *	529,009(F)**
70	Korah Twp.(S3)	205,500(F)**	111	Sudbury(S3)*	462,760(F)**
71	A Timmins *	251,956(F)**	112	A Mattawa *	321,445(F)**
72	Shelburne & Ext*	209,000(F)**	113	Parry Sound	904,894(F)
73	Pt. Colborne(S2)*	155,975(F)**	114	Arthur Vill.*	179,916(F)**
61-S-74	Espanola *	615,301(F)**	115	A Pt. Dover *	754,197(F)**
75	Preston(S2)	87,629(F)**	116	New Liskeard	344,532(F)**
76	Nepean Twp(S2)	162,541(F)**	117	Korah Twp.	261,000(F)**
77	A Georgetown (S2)*	63,230(F)**	118	Elmvale *	180,000(F)*
78	A Toronto Twp(S3)*	571,626(F)**	119	A Waterford *	310,998(F)**
79	Fauquier Twp. (Moonbeam)	126,743(F)	120	A Simcoe *	420,291(F)**
80	A Grimsby S. Twp. (Smithville)*	249,314(F)*	121	Sidney Twp. (Battawa)	175,374(F)**
81	Vankleek Hill*	205,000(P)	122	A Sutton *	328,497(F)**
82	A Toronto Twp(S4)	282,096(F)**	123	Harriston *	317,418(F)
83	A Grimsby (S2)	28,369(F)**	124	A Lindsay	410,519(F)*
84	Belleville *	2,224,978(F)**	125	A Elora	402,676(F)**
85	A Tavistock	47,988(F)**	126	A St. Catharines St. Catharines Ext.	17,400(F)**
	Tavistock (S2)	293,050(F)**	127	Gananoque *	620,000(F)**
	Tavistock (S3)	76,000(F)**	128	A Saltfleet *	545,236(F)**
86	Newmarket *	288,795(F)**	129	Wingham (Storm)	26,982(F)**
87	A Newmarket/East Gwillimbury *	1,040,976(F)**	130	Almonte *	239,000(F)**
88	Moore Twp. (Corunna)*	862,088(F)**	131	Englehart	4,260(F)**
89	Port Credit *	227,000(F)**	132	A Alexandria	206,770(F)**
	A Port Credit Ext.	19,243(F)**	133	Burlington (S4) *	758,793(F)**
90	Galt (S3) *	1,370,000(F)**	134	A Tarentorus *	163,638(F)**
91	A Ft. William & Ext. *	924,260(F)**	135	Burlington (S5) *	71,375(F)**
92	Pickering Twp*	585,500(F)**	136	Listowel	48,000(F)**
93	Exeter *	344,000(F)**	137	A Powassan *	30,053(F)**
	Exeter Ext.*	17,694(F)**	63-S-138	A Toronto Twp. (S5)	249,933(F)**
94	Aylmer *	467,000(F)**	139	A Wingham(San)	310,672(F)**
95	Trenton(S2)*	202,000(F)**	140	A Frankford	26,527(F)**
96	Elmira *	621,000(F)	141	Bradford *	25,400(P)
97	Markham Twp. (San.)St. 1	67,501(F)**	142	Essex (Town).	185,220(F)
97B	Markham Twp. (San.)St. 2	977,697(F)*	143	Essex (Industry)	83,812(P)
98	Kingston Twp*	1,739,737(F)**	144	Chelmsford	53,545(F)
99	Cumberland Twp Cumberland Twp Ext.	58,000(F)** 45,220(F)**	145	A Toronto Twp. (S6) *	230,947(F)**
62-S-100	Pt. Colborne (S4)	1,632,742(F)	146	Midland *	885,510(F)*
101	A Pt. Arthur(S2)	401,723(F)**	147	A Thorold	201,565(F)**
102	Chatham	3,146,343(F)**	148	Durham	255,000(P)
103	Widdifield(S2)	232,035(F)**	149	Brighton *	226,347(F)
104	Norwich Vill.	4,000(P)	150	Richmond Hill	28,500(P)
105	Burlington(S3)*	2,100,000(F)**	151	Midland *	194,500(F)**
106	Michipicoten Twp.(Wawa)*	360,802(F)**	152	Englehart *	110,169(F)
107	A Niagara *	360,894(F)**	153	Rockland	318,516(F)
108	Pt. Colborne (S3) *	191,000(F)**	154	Emo Twp.	118,000(P)
			155	Ernestown	122,515(F)**
			156	Pt. Arthur	690,686(F)
			157	Little Current	246,653(F)**

Project Number	Municipality	Cost Estimate	Project Number	Municipality	Cost Estimate
63-S-158	Saltfleet Twp.	235,000(F)	64-S-170	March, Nepean & Goulburn	
159 A	Burlington *	467,159(F)**		(Engineering)	15,000(F)
160	Metro Toronto/ Toronto Twp. (Engineering)	40,000(F)	171	Sutton Ext.	44,028(F)**
161	Chelmsford	21,200(P)	172	Cornwall * & x Stages 1 & 2	1,551,037(F)
162	Burlington *	terminated	173	Ft. William (Brunswick)	33,209(F)
163	Waterdown	329,000(P)	174	Listowel	40,204(P)
164	Lucan	176,480(F)	175	Ft. William (Kam)	956,896(F)
64-S-165	Burlington *	135,333(F)	176	Blenheim	375,000(P)
166	Milverton	248,700(P)	177	Woodbridge	498,500(P)
167	Cumberland (special agreement)	175,000(P)	178	Petrolia	235,000(P)
168	Black River	58,100(P)	179	Bucke Twp.	153,686(P)
169	Moore Twp. (Corunna)	27,840(P)	180	Kingsville	384,825(P)

TOTAL NUMBER OF SEWAGE PROJECTS 178 TOTAL COST ESTIMATED SEWAGE \$88,490,777



W A T E R W O R K S

Projects covered by (P)reliminary, (F)inal or (T)est (D)rilling agreement

Project Number	Municipality	Cost Estimate	Project Number	Municipality	Cost Estimate
57-W-1	A Markham Twp.	498,685(F)**	59-S-46	A Chesterville	293,610(F)**
2	Frankford	119,402(F)**	47	A Bertie Twp.	763,735(F)**
3	A Bancroft	240,290(F)**	48	McGregor Area	8,000(TD)
4	Harrow	500,439(F)**	49	A Midland	47,646(F)**
5	A Havelock	177,282(F)**	50	Port Burwell	10,000(TD)
6	A Port Perry	62,421(F)**	51	Kenora	99,070(P)
7	A Dresden	170,829(F)**	52	Hastings & Ext.	201,839(F)**
8	A Brock Twp. (Sunderland)	98,558(F)**	53	A Whitby Twp. (Brooklin)	170,381(F)**
9	A Winchester	265,324(F)**	54	A Clarke Twp. (Orono)	7,256(TD)
10	Not used			Waterdown	10,000(TD)
11	A Richmond Hill	218,457(F)**	60-W-55	Haileybury	abandoned
12	A Essex County (Union System)	3,841,800(F)**	56	A Fenelon Falls	331,067(F)**
13	A Essex Town (Standpipe)	86,383(F)**	57	West Ferris	68,859(F)**
58-W-14	Alfred	139,350(F)**	58	A Brampton	264,679(F)**
15	Dundas	341,325(F)**	59	A Wellington	246,526(F)**
16	Markham Vill.	46,745(F)**	60	A King Twp.	389,111(F)**
17	Dunville Area	2,585,688(F)**	61	Campbellford	135,000(P)
18	Kitchener	288,513(F)**	62	A Galt	200,005(F)**
19	A Huntsville	102,305(F)**	63	A S. S. Marie	76,575(F)**
20	A Orangeville	70,817(F)**	64	A Blind River	29,708(F)**
21	A Bolton	60,742(F)**	65	Vankleek Hill	164,500(P)
22	A Preston	258,424(F)**	66	Playfaire Twp. (Ramore)	47,259(F)**
23	Leamington(W2)	23,299(F)**	67	A Ratter & Dunnet (Warren Area)	80,716(F)**
24	A Stayner	59,056(F)**	68	Goderich	997,000(F)**
25	Marmora & Exts.	238,097(F)**	69	A Beaverton	9,176(F)**
26	A Ancaster	189,556(F)**	70	A S. S. Marie (W2)	114,542(F)**
27	A Bracebridge Area	77,455(F)**	71	Espanola	558,000(F)**
28	Cookstown	142,000(F)**	61-W-72	A Hanover	45,810(F)**
59-W-29	A Meaford	483,129(F)**	72	Acton	177,000(F)**
30	A Belle River	55,354(F)**	73	A Gosfield S.(W2)	95,945(F)**
31	Maidstone	217,239(F)**	74	Brantford Twp.	245,000(F)**
32	A Trafalgar Twp. (now Oakville)	215,992(F)**	75	Brampton & Ext.	546,700(F)**
33	A Hespeler	12,546(F)**	76	Fauquier Twp. (Moonbeam)	119,500(F)
34	A Elmvale	58,171(F)**	77	A Dresden (W2)	109,574(F)**
35	A Thedford	175,707(F)**	78	Geraldton	57,850(F)**
36	A Tara	8,437(F)**	79	A Anson, Hindon & Minden & Ext.	154,559(F)**
37	A Cannington	4,487(TD)	80	Pelham Twp.	20,000(TD)
38	Newcastle	156,043(F)**	81	Beaverton (W2)	83,000(F)**
39	Grand Bend	12,000(TD)	82	Gloucester Twp. (Orleans)	10,000(TD)
40	A Bath Vill.	29,825(F)**	83	McDougall Twp.	8,000(TD)
41	Val Albert	227,075(P)	84	A S. S. Marie(W3)	1,097,000(F)**
42	A Mitchell	164,505(F)**			
43	A Dresden (W2)	17,088(F)**			
44	A Caledon East	99,910(F)**			
45	A Parkhill	158,375(F)**			

Project Number	Municipality	Cost Estimate	Project Number	Municipality	Cost Estimate
61-W-86B	S.S. Marie(W4)	210,000(F)**	63-W-113	Chalk River	167,533(F)
87	Bradford	158,000(F)**	114	Essex County	
88	Widdifield	232,000(F)**	115 A	Geraldton	128,639(F)**
89	Rockland	116,000(F)**	116 A	Woodslee Area	186,294(F)**
90	Petawawa	188,500(F)**	117	Chapleau	12,000(TD)
91	Toronto Twp.	147,000(F)**	118 A	Whitchurch	145,687(F)**
92	Watford/Wyoming/ Plympton	506,084(F)**	119 A	S.S. Marie	557,700(F)**
93	Eganville	5,000(TD)	120 A	Newcastle	19,688(F)**
	Eganville	165,903(F)	121	Cache Bay	134,910(P)
94	Cumberland Twp.	186,969(F)**	122	Emo Twp.	132,000(P)
	Cumberland Twp. Ext.	248,549(F)**	123	Havelock	7,000(TD)
95	Brunetville	-0-	124	Southampton	258,000(P)
62-W-96	Point Edward	309,800(P)	125 A	Thorah Twp.	93,436(F)**
97	Toronto Twp.(W2)	422,500(F)**	126	Midland	15,000(TD)
98	Bertie Twp.(W2)	61,600(F)**	127	McGregor Area	248,560(F)
	Bertie Twp.Ext.	5,500(F)**	128 A	Saltfleet Twp.	160,124(F)**
99	Brantford Twp. (W2)	121,312(F)**	64-W-129	Brampton	144,000(P)
100	Deseronto	12,000(TD)	130	Clarke Twp.	174,014(P)
101	Mersea (W2)	20,283(F)**	131	Maidstone	75,282(P)
102 A	Richmond Hill(W2)	89,845(F)**	132	Michipicoten	145,065(P)
103	Saltfleet Twp.	366,000(F)**	133	Widdifield Twp.	25,260(P)
104 A	Markham Twp.	335,740(F)**	134	Marmora	55,644(P)
105	Michipicoten	100,153(F)**	135	Plantagenet	24,500(P)
106	Englehart	4,435(F)**	136	Brampton	367,800(P)
63-W-107 A	Louth Twp.	202,344(F)**	137	Winchester	18,000(P)
	Louth Twp. Ext.	4,600(F)**	138	S.S. Marie	415,000(P)
108 A	Harrow	102,062(F)**	139	Wicksteed Twp.	219,800(P)
109 A	Frankford	28,186(F)**	140	Bucke Twp.	131,400(P)
110	Bobcaygeon	7,000(TD)			
111 A	Belle River	156,752(F)**			
112 A	Neelon & Garson	105,518(F)**			

TOTAL NUMBER OF WATER PROJECTS 136 TOTAL COST ESTIMATED WATER \$29,789,494

S U M M A R Y			
TOTAL SEWAGE PROJECTS	178	TOTAL COST ESTIMATED - SEWAGE	\$ 88,490,777
TOTAL WATER PROJECTS	136	TOTAL COST ESTIMATED - WATER	29,789,494
	314		\$118,280,271

NUMBER OF MUNICIPALITIES PARTICIPATING 198



DATE DUE

[illegible]

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